CBE, Sierra Club, Center, ForestEthics et al. Comments on the Revised Draft Environmental Impact Report for the Phillips 66 Company Rail Spur Extension and Crude Unloading Project

ATTACHMENT C3

Attachments to Expert Report of Phyllis Fox on the Revised Draft Environmental Impact Report for the Phillips 66 Rail Spur Extension and Crude Unloading Project, November 2014.

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EXHIBIT 2

Comments

on

Environmental Impact Report

for the

Phillips 66
Rail Spur Extension Project

Santa Maria, California

Prepared
for
Sierra Club
San Francisco, CA

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I. INTRODUCTION

The Phillips 66 Santa Maria Refinery (SMR), located in San Louis Obispo County, is proposing to modify an existing rail spur to accommodate train delivery of crude oil, to replace local supplies. The proposed tracks and unloading facilities would be designed to accommodate unit trains of up to 80 tank cars and associated locomotives and other supporting cars as well as periodic manifest trains of fewer cars not dedicated to SMR oil. (Project). I was asked by the Sierra Club to review the Draft Environmental Impact Report (DEIR)[1] on this Project and prepare comments on the adequacy of the project description and the hazards and hazardous materials section.

My evaluation, presented below, indicates the DEIR's Project description is incomplete. First, it fails to disclose the baseline crude slate composition, which determines the CEQA baseline emissions from crude import through refining. Second, it fails to disclose the link between the Rail Spur Project and two other directly related projects: (1) the Propane Recovery Project at Phillips 66's Rodeo facility,[2] which is linked by pipeline to the Rodeo Refinery, and (2) the Throughput Increase Project at the Santa Maria Refinery[3]. The impacts of these directly related projects should be evaluated as a single project. Together, they result in many significant impacts that were not disclosed in the Rail Spur Project DEIR.

The DEIR fails to evaluate the impacts resulting from a significant switch in crude slate, the raison d'etre for the Project. The entire Project, including crude slate change, would result in significant unmitigated air quality, global warming, worker and public health, odor, risk of upset, public safety, visual, noise, and other impacts, either not disclosed or not mitigated in the DEIR. Finally, the DEIR fails to evaluate reasonable alternatives to the Project and to impose all feasible mitigation.

My resume is included in Attachment 1 to these comments. I have over 40 years of experience in the field of environmental engineering, including air emissions and air pollution control; greenhouse gas emission inventory and control; air quality management; water quality and water supply investigations; hazardous waste investigations; hazard investigations; risk of upset modeling; environmental permitting; nuisance investigations (odor, noise); environmental impact reports, including CEQA/NEPA documentation; risk assessments; and litigation support.

I have M.S. and Ph.D. degrees in environmental engineering from the University of California at Berkeley with minors in Hydrology and Mathematics. I am a licensed

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[1] Marine Research Specialists (MRS), Phillips 66 Company Rail Spur Extension Project Public Draft Environmental Impact Report and Vertical Coastal Access Assessment, November 2013.

[2] Contra Costa County Department of Conservation and Development, Phillips 66 Propane Recovery Project, Final Environmental Impact Report, November 2013 (FEIR).

[3] Marine Research Specialists, Phillips 66 Santa Maria Refinery Throughput Increase Project, Final Environmental Impact Report, October 2012 (SMF FEIR), Available at: http://slocleanair.org/phillips66feir.

professional engineer (chemical, environmental) in five states, including California; a Board Certified Environmental Engineer, certified in Air Pollution Control by the American Academy of Environmental Engineers; and a Qualified Environmental Professional, certified by the Institute of Professional Environmental Practice.

I have prepared comments, responses to comments and sections of EIRs for both proponents and opponents of projects on air quality, water supply, water quality, hazardous waste, public health, risk assessment, worker health and safety, odor, risk of upset, noise, land use and other areas for well over 100 CEQA documents. This work includes Environmental Impact Reports (EIRs), Negative Declarations (NDs), and Mitigated Negative Declarations (MNDs) for all California refineries as well as various other permitting actions for tar sands and light shale crude refinery upgrades in Indiana, Louisiana, Michigan, Ohio, South Dakota, Utah, and Texas and liquefied natural gas (LNG) facilities in Texas, Louisiana, and New York. I was a consultant to a former owner of the subject Refinery on CEQA and other environmental issues for over a decade and am thus very familiar with both the Rodeo Refinery and the Santa Maria Refinery and their joint operations.

My work has been cited in two published CEQA opinions: (1) *Berkeley Keep Jets Over the Bay Committee, City of San Leandro, and City of Alameda et al. v. Board of Port Commissioners* (August 30, 2001) 111 Cal.Rptr.2d 598 and *Communities for a Better Environment v. South Coast Air Quality Management Dist. (2010) 48 Cal.4th 310.*

II. THE PROJECT IS PIECEMEALED

The DEIR only evaluated a portion of the Project. The Project as described in the DEIR is narrowly defined as a modification to an existing rail spur extension to allow crude to be delivered to the Santa Maria Refinery by train for processing. DEIR, p. 2-1. However, as explained below, the Rail Spur Project is actually only one of the components of a much larger project consisting of at least three parts: (1) Throughput Increase Project; (2) Rail Spur Project; and (3) Propane Recovery Project at Rodeo.

The Santa Maria Refinery currently receives all crude oil by pipeline from various mostly local sources, including the Outer Continental Shelf (60-85%), Price Canyon/Santa Maria Valley/San Joaquin Valley (5-20%), San Ardo (5-10%), and Canada (2-7%). DEIR, p. 2-27. Most all of these sources, particularly the major ones -- offshore platforms and local oil fields -- are in decline. DEIR, p. ES-18 ("However, if and when local crude oil production (the major source of oil for the SMR) declines, the Rail Spur Project...would allow the SMR to maintain operating up to its permitted throughput levels."), p. 2-30 ("In addition, production from offshore Santa Barbara County [the major source of SMR's crude] has been in decline for a number of years... This declining production... generates the need for the Rail Spur Project."), p. 6-3 ("California production of crude oil per year has been in decline since 1986...The decline has average about 1.7% per year since 1995. More recently, the decline has averaged over 3% annually since the year 2000... Delivery of other North American crudes to California could help to offset the need for foreign imports as local production declines.") Thus, the

Throughput Project likely could not be implemented but for the Rail Spur Project, which allows crudes to be imported to replace declining local sources.

A. Link With Crude Throughput Increase Project

Thus, Phillips 66 is arguing on the one hand that the Rail Spur Project is required to replace dwindling local crude supplies while on the other it has proposed to increase its throughput capacity, without disclosing the source of the new crude. Clearly, Phillips 66 anticipated the need to increase its crude supply, given the diminishing local supplies, when it was planning the Crude Throughput Increase Project in 2008,[4] at a time it faced dwindling local crude supplies at high costs. Thus, the need to import more cost-effective crudes from distant sources, accessible only by rail, must have been on the table at the time the Throughput Increase Project was developed.

The decline in local crude supplies is not news and has long been known.[5] In fact, given the admitted declining local sources of crude, it is not believable that the SMR could increase its throughput by 10%, when a 3% annual decline in its major source of oil is projected, without changing its source of crude. This is prima facie evidence that the Throughput Increase Project and the Rail Spur project are related and were likely planned together. Thus, one of the key purposes of the Rail Spur Project is to build the infrastructure to allow crude oil to be imported from distant sources to replace declining local crude oil sources and facilitate a 10% increase in crude throughput, separately permitted.

The average baseline crude throughput for Santa Maria (2010-2012) is 38,029 barrels per day (BPD). DEIR Table 2.7. The Throughput Increase Project increased the permit level from 44,500 BPD (Throughput FEIR, p. ES-4) by 10% to a maximum of 48,950 BPD or by 4,450 BPD. Throughput FEIR, p. 1-1. Thus, the SMR was operating at 6,471 BPD below the CEQA baseline for the Rail Spur Project and 10,921 BPD below the projected future daily maximum throughput. It is unlikely that the permitted crude throughput of 48,950 BPD (DEIR, p. 2-28) could be supplied locally, given the decline in locally available crudes.

Thus, the Rail Spur Project is required to achieve the increase in throughput. The Rail Spur Project essentially opens up new markets for the Santa Maria Refinery, allowing it to replace declining local sources, supply the 10% permitted throughput increase, and compete with any increase in locally produced crudes. This ties the Rail Spur Project directly to the Throughput Increase Project. Thus, these two projects are different sides of the same coin and should have been evaluated as a single project.

The Rail Spur Project will allow an increase in crude processing of up to 10,921 BPD. The DEIR did not, but must, analyze all of the impacts of this increase in

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[4] The DEIR was issued August 2011, Available at: http://www.slocleanair.org/COP3.php.

[5] California Energy Commission, Transportation Energy Forecasts and Analyses for the 2009 Integrated Energy Policy Report, May 2010.

crude throughput processing capacity, including the increase in emission of processing an additional 10,921 BPD of crude and the increase in emissions of a change in the crude slate itself. The DEIR analyzes none of the impacts associated with a 10,921 BPD increase in crude throughput or the change in crude slate.

B. Link With Propane Recovery Project at Rodeo

Both of these Santa Maria projects are directly related to a third project at Phillips 66's San Francisco Refinery, located in Rodeo in the San Francisco Bay Area. The Rodeo Refinery and the Santa Maria Refinery are connected by a 200-mile pipeline, used to transport semirefined products from Santa Maria to Rodeo for finishing into market products. DEIR, p. 2-3. These two locations, although more than 200 miles apart, are considered one location.[6] The Phillips 66 website similarly describes these facilities thus: "The San Francisco Refinery is comprised of two facilities linked by a 200-mile pipeline. The Santa Maria facility is located in Arroyo Grande, Calif., while the Rodeo facility is in the San Francisco Bay Area."[7]

The two facilities operate in unison, the Santa Maria Refinery supplying feedstocks, naphtha and gas oil, to Rodeo via pipeline to be upgraded into finished petroleum products, such as gasoline and jet fuel. DEIR, p. 2-3. Thus, these two refineries are inextricably linked. Changes in operations at one of them manifest as changes in the other. A change in crude slate at Santa Maria, for example, will manifest as changes in emissions from refining the resulting semi-refined products at Rodeo.

The Rodeo Refinery is proposing to recover an additional 4,200 barrels per day (BPD) of propane and 3,800 BPD of butane from the refinery fuel gas (RFG) (collectively known as "liquefied petroleum gas" or LPG) to export for sale (Project).[8] My review of the FEIR for that project indicates that the Rodeo Refinery as operated in the baseline would be unable to recover this amount of LPG without increases in the amount of propane- and butane-containing feed to the affected units. Fox Report[9], Comment II.

The partially refined products from the increase in crude throughput at Santa Maria will be sent to the Rodeo Refinery for further processing. As explained below, these partially refined products include significant amounts of propane and butane that will be recovered at Rodeo under the Propane Recovery Project to meet its design LPG recovery goal. Thus, cumulative impacts of these three projects -- crude throughput

[6] BAAQMD, Review of Current Air Monitoring Capabilities near Refineries in the San Francisco Bay Area, July 3, 2013; p. 1-5, Available at: http://www.baaqmd.gov/~/media/Files/Technical%20Services/DRI_Final_Report_061113.ashx.

[7] http://www.phillips66.com/EN/about/our-businesses/refining-marketing/refining/Pages/index.aspx.

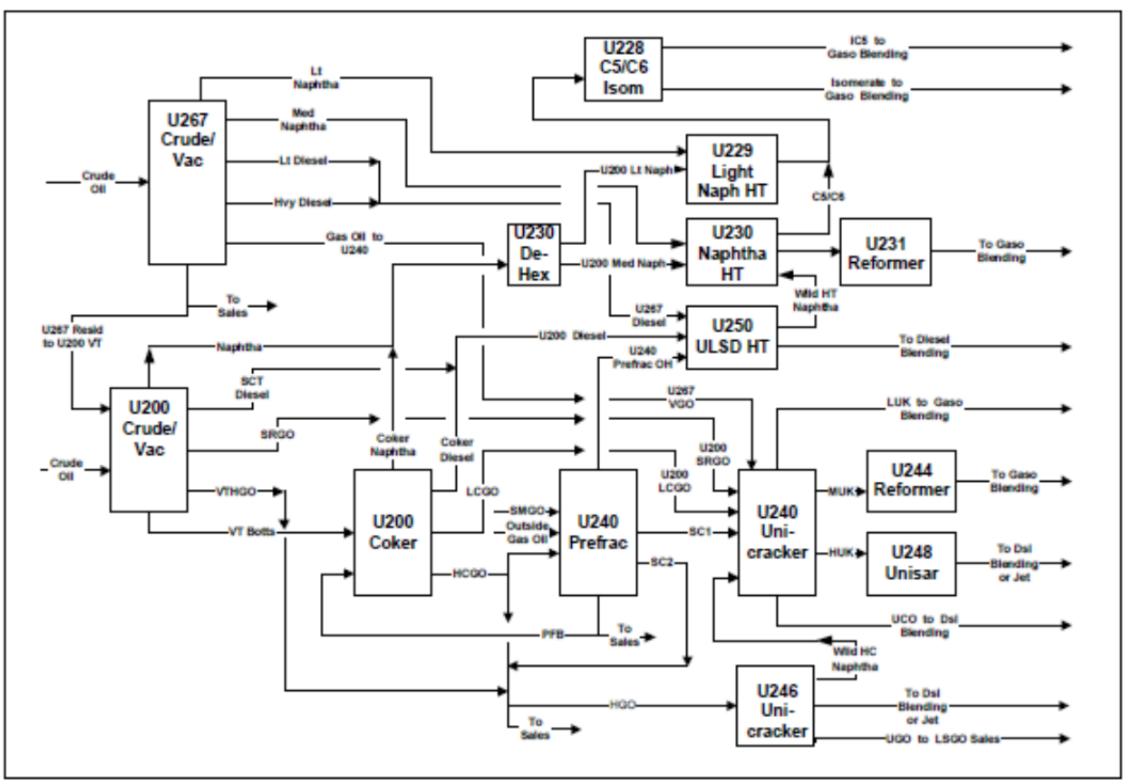
[8] Contra Costa County Department of Conservation and Development, Phillips 66 Propane Recovery Project, Final Environmental Impact Report, November 2013 (FEIR).

[9] *See* Fox Rodeo Report, Comment II.

increase + rail spur to supply the increased crude + project to recover propane/butane from the increased throughput -- should have been evaluated as a single project.

The link between the Santa Maria Refinery semi-refined products (gas oil, naptha) and the Rodeo Propane Recovery Project is clearly shown in the Rodeo Refinery block flow diagrams from the Rodeo Propane Recovery DEIR. The block flow diagram for the existing Rodeo Refinery (Rodeo DEIR Figure 3-4) shows "SMGO" entering the Refinery at the U-240 Prefractionator unit (Prefrac unit). See Rodeo DEIR, p. 3-12 ("Heavy gas oil (HGO) streams from Unit 200 and HGO purchased from outside of the Refinery are fractionated in the Unit 240 prefractionator.") SMGO is Santa Maria Gas Oil. This Rodeo DEIR figure is reproduced here as Figure 1 for ease of reference. The U-240 Prefrac unit at Rodeo separates Santa Maria gas oil and other gas oils into lighter hydrocarbon fractions that are currently blended into the Rodeo Refinery Fuel Gas, shown in Rodeo DEIR Figure 3-5 (see lower left hand corner, blue arrow labeled U-240/244/248 S-RFG being routed to U-240 Fuel Gas Treating), but which will be further processed into propane and butane in new units added to the Rodeo Refinery as part of the Propane Recovery Project.

Figure 1
Overall Existing Rodeo Refinery
Block Flow Diagram

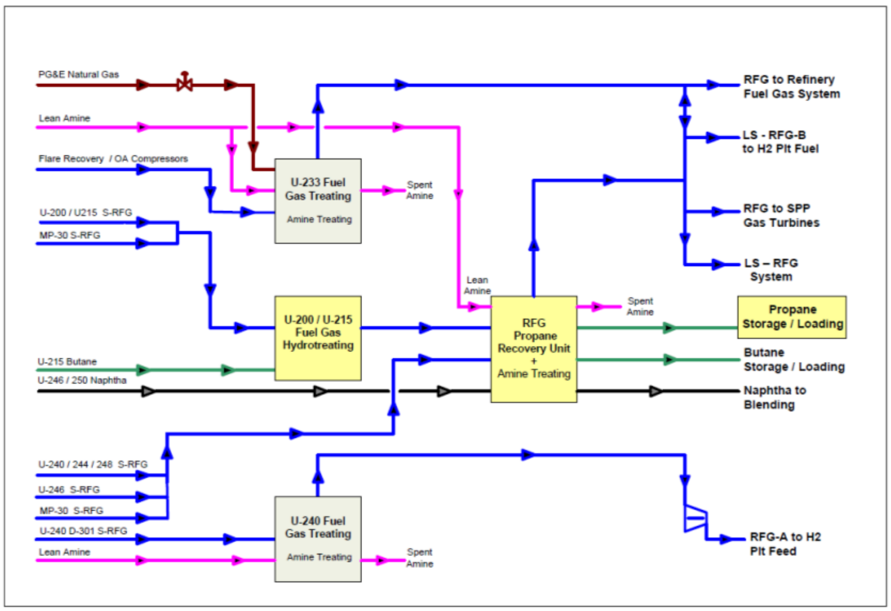


SOURCE: Phillips 66 Company

Phillips 66 Propane Recovery Project . 120546
Figure 3-4
Overall Block Flow Diagram of Refinery

Under the Propane Recovery Project at Rodeo, the output from the Prefrac unit is sent to the proposed "RFG Propane Recovery Unit" instead of the Refinery Fuel Gas system. This unit is the heart of the Propane Recovery Project. Rodeo DEIR, Table 3-2. Propane and butane are recovered in this unit. This new propane/butane extraction unit is shown in Propane Recovery Project DEIR in Figure 3-6, which is reproduced here as Figure 2 for ease of reference.

Figure 2
Proposed Rodeo Refinery
Fuel Gas System Block Flow Diagram



SOURCE: Phillips 66 Company

Phillips 66 Propane Recovery Project . 120546
Figure 3-6
Proposed Refinery Fuel Gas System Block Flow Diagram

The RFG Propane Recovery Unit is the big yellow box in the middle of Figure 2. Blue arrows in the lower left hand corner of Figure 2 identify the inputs to this unit, which are various refinery streams. These streams include "U-240/244/248 S-RFG." This designation means that Refinery Fuel Gas (RFG) from Unit U-240 is sent to the RFG Propane Recovery Unit. (This stream was formerly sent to the U-240 Fuel Gas Treating Unit. Rodeo DEIR, Fig. 3-6.) As Santa Maria Gas Oil (SMGO) is one of the inputs to Unit U-240, changes at the Santa Maria Refinery would be transmitted directly to the Propane Recovery Project via the U-240 Prefrac Unit at Rodeo.

This establishes a direct link between the Rodeo Propane Recovery Project and the two modifications at the Santa Maria Refinery -- the Throughput Increase Project and the Rail Spur Project to supply the increase in crude. This is the "nexus" to the larger project with the potential to change crude oil feedstocks.

The increase in throughput at the Santa Maria Refinery would increase the amount of SMGO and naphtha processed at Rodeo into propane and butane. As discussed elsewhere in these comments, the new rail spur at the Santa Maria Refinery would enable tar sands and other crudes to be imported to and processed at Santa Maria. Tar sands crudes imported by rail are blended with a diluent that is rich in butane and propane. Other potential imports, including Bakken crudes, also are rich in propane and butane feedstocks required at Rodeo. Thus, both projects proposed for the Santa Maria Refinery will have a direct impact on the amount of propane and butane available for recovery at Rodeo, making up for the deficit in the propane and butane in Rodeo refinery fuel gas for LPG recovery.

Thus, there is both a direct pipeline link between the two facilities, an explicit statement that the Santa Maria Throughput Increase Project was developed to send more semi-refined product to the Rodeo Refinery, a pipeline linking the two facilities, and a direct process link between those products and the input to the Propane Recovery Project disclosed on the process flow diagrams. These factors establish a nexus between the Santa Maria Rail Spur and Throughput Increase Projects and the Propane Recovery Project at Rodeo. Thus, these projects are integrally related and should be evaluated as a single project under CEQA.

III. THE PROJECT WOULD REPLACE THE EXISTING CRUDE SLATE WITH CHEMICALLY DISTINCT CRUDES

The DEIR strongly hints that the Project would import Bakken crudes, noting the Rail Spur Project would import crude oil “sourced from oilfields throughout North America based on market economics and other factors. The most likely sources would be the Bakken field in North Dakota or Canada.” DEIR, p. ES-3. Elsewhere, the DEIR indicates: “These could include fields as far away as the Bakken field in North Dakota or Canada.” DEIR, p. 2-21. See also: “The most likely sources of crude oil for the SMR would be North Dakota, Canadian, and Mid Continent area.” DEIR, p. 4.12-21. This crude is chemically distinct from the existing crude slate. Further, as discussed below, the Rail Spur Project is also designed to import Canadian tar sands crudes. These tar sands crudes are also chemically distinct from the baseline crude slate. These differences in crude slate composition will result in significant impacts that were not disclosed in the DEIR.

A. Bakken Crudes As Feedstock for the Santa Maria Refinery

The Project description suggests that Bakken crudes would be imported by rail. While we believe this is unlikely for the reasons outlined below, the DEIR must nevertheless, given its assertions, evaluate the impact of refining this crude, which is chemically distinct from the current crude slate and from tar sands.

A refiner’s choice of crude oil is influenced by the specific collection of processing units at the refinery and their design. Refinery configurations are unique and are typically designed to process a specific crude slate. The challenge for a refinery, then, is finding the cheapest crude that is compatible with the refinery's design.

The Santa Maria Refinery is designed to refine heavy, high sulfur crudes, such as those available locally with a general composition as summarized in Table 1, below. DEIR, p. 2-3.

Table 1
Properties of Crude Oil Currently Refined at Santa Maria (DEIR, Table 2.6).

Characteristic	Value
Gravity, API	19
Specific Gravity at 60 degrees Fahrenheit	0.9377
Hydrogen Sulfide Concentration	< 1 parts per million by weight
Sulfur content	4.6 % by weight
Light ends (propane thru Hexanes)	Approximately 6 %
Vapor Pressure (dry equivalent, DVPE)	6.95 pounds per square inch
Kinematic Viscosity at 104 degrees Fahrenheit	245 centistokes

The Santa Maria Refinery consists of atmospheric pressure distillation, vacuum distillation, delayed coking, and sulfur recovery, designed specifically to breakdown these local heavy high sulfur crudes into semirefined products. The semi-refined products -- gas oil and naphtha -- require additional refining at Rodeo to convert them into gasoline and other finished products. DEIR, Sec. 2.0. Thus, major changes in the crude slate at Santa Maria would necessarily result in major design changes at both the Santa Maria and Rodeo Refineries. More naphtha, especially lighter napthas, and less gas oil would be produced at Santa Maria, requiring accommodations in throughputs and process design at Rodeo, e.g., contributing to propane and butane that would be recovered at Rodeo with the Propane Recovery Project. The DEIR does not disclose any refinery design changes at either location. Thus, the DEIR is either deficient in this regard, i.e., for not disclosing design changes and their impacts, or Bakken crude is not a serious option.

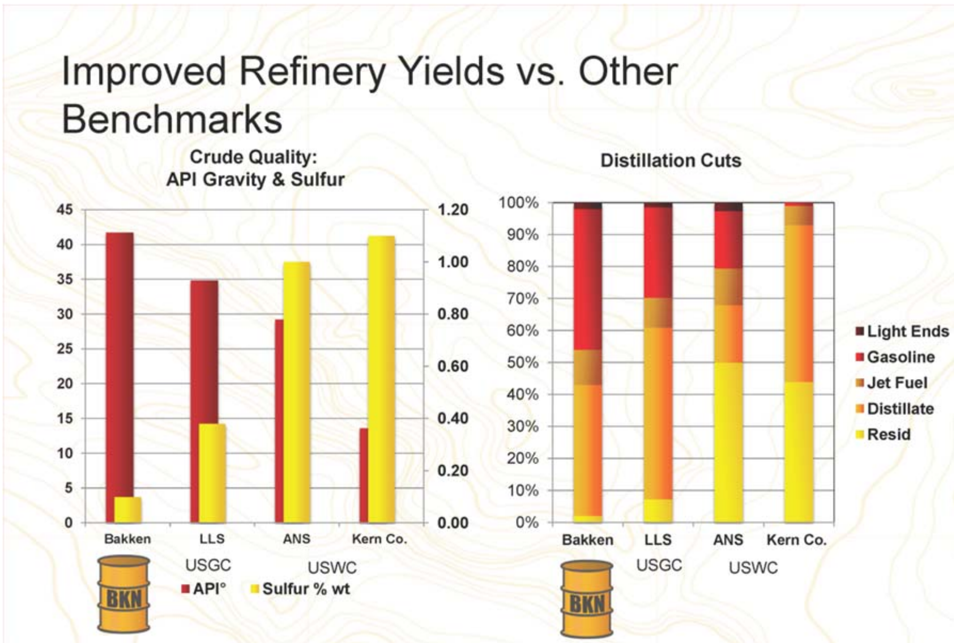
All refineries have criteria for accepting crudes for processing. These were not disclosed in the DEIR and should have been as environmental impacts cannot be fully assessed without them. The switch from a heavy high sulfur crude (current) to very light low sulfur crude (Bakken) would require process design changes, such as changes to the distillation units, idling of the coker and sulfur recovery units, and new tankage. The DEIR does not disclose any refinery design changes.

Bakken crude[10] is a "light" (i.e., very volatile) crude with a high API gravity (>40^{o}) and very low sulfur content (<0.2%)[11] that is not similar to the current crude

[10] Cenovus, Bakken Light Crude Oil, Available at: http://www.cenovus.com/contractor/docs/CenovusMSDS_BakkenOil.pdf. See also crude composition data at: Enbridge Pipelines Inc. 2013 Crude Characteristics No. 44, Available at: http://www.enbridge.com/DeliveringEnergy/Shippers/~/media/www/Site%20Documents/Delivering%20Energy/2013%20Mainline%20Crude%20Characteristics.pdf.

feedstock shown in Table 1. When refined, it yields very little residuum (coker feed) and large amounts of gasoline. Figure 3 The current slate, which is similar to the Kern County crude shown in Figure 3, consists of heavy (API 19°) (i.e., not volatile), sour (4.6% sulfur) crude. When refined, it yields large amounts of residuum, which must be processed in the cokers to extract lighter products amenable to pipelines transport and further processing at Rodeo.

Figure 3
Composition of Bakken Compared to
Typical Heavy Crude (Kern)



The Rail Spur Project is being designed to import essentially 100% of the Refinery's permitted daily throughput crude capacity by rail[12] and 73% of its annual

[11] Bakken has recently soured and sulfur content of 0.17-2.0 ppm are now reported. Prices fell with the souring. See https://www.onepetro.org/conference-paper/SPE-141434-MS; http://www.reuters.com/article/2013/05/29/column-kemp-bakken-pipelines-idUSL5N0EA3SU20130529.

[12] In the Rail Spur baseline, assumed to be 2010 to 2012, the Refinery processed an average of 38,029 BPD. DEIR, Table 2.7. The permitted maximum daily throughput in the baseline is 44,500 BPD. DEIR, Table 3.1. The Rail Spur Project is designed to import one unit train per day, carrying up to 2,190,000 gallons or up to 51,143 BPD of crude oil. DEIR, pp. ES-5, 1-4. An FEIR has been issued for a throughput increase project which would increase the daily permit level by 10% to a maximum of 48,950 BPD (DEIR, p. 2-28 and Table 3.2) and the annual throughput from 16,242,500 BPY to 17,866,750 BPY. Throughput FEIR, p. 2-26.

average throughput.[13] While small amounts of Bakken could be blended with locally sourced or heavy high sulfur crudes or imported tar sand crudes without significant refinery design changes, it is unlikely that Bakken would ever comprise a large fraction of the Santa Maria crude slate without major capital projects not disclosed in the DEIR. The Santa Maria Refinery is not designed to process light sweet crude. Further, as discussed elsewhere in these comments, light sweet crudes such as Bakken generally command a premium in the market. Thus, it is unlikely that Bakken crudes would comprise a significant fraction of the Santa Maria slate as long as cheaper Canadian tar sands crudes are available.

A switch to Bakken would require significant modifications at both the Santa Maria and Rodeo Refineries that are not disclosed in the DEIR. The cokers and sulfur recovery unit, for example, would likely be idled or modified to reduce their processing rates if large amounts of Bakken were refined as Bakken contains very little residuum, *i.e.*, the coker feed, and very little sulfur. New storage tanks would be required, or an increase in permitted throughputs of existing storage tanks and changes in the design of tank vapor control systems to handle higher vapor pressure materials would be required. The capital investment in most of the existing refining equipment would be lost along with the income from selling sulfur and coke. An entirely different refinery would be required to capture maximum value from Bakken crude. No such changes are disclosed in the DEIR.

Further, emissions from the Refinery and pump stations along the pipeline connecting Santa Maria and Rodeo would be significantly different from those in the baseline. If the crude slate were switched to Bakken, combustion emissions at the Santa Maria Refinery would decrease, offsetting some of the increases in locomotive emissions. However, volatile organic compound (VOC) and hazardous air pollutant (e.g., benzene) emissions from tanks and fugitive components, including pump stations along the pipeline (Santa Margarita, Shandon, Cuesta), would significantly increase, likely enough to trigger PSD review for the rail spur as a major modification. These increases would also result in significant worker and public health impacts.

Changes in the type and amount of semi-refined products sent to Rodeo would also change, resulting in changes in emissions at Rodeo. The DEIR does not disclose any changes in emissions at the Santa Maria or Rodeo Refineries from processing the rail-imported crude. This omission either eliminates Bakken as the major crude import, pointing to a heavy, higher sulfur crude, such as tar sands, or renders the DEIR deficient for failing to analyze the impacts of the crude switch.

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[13] The 2012 throughput was 13,274,829 bbl/year, 3-year average throughput was 13,858,563 bbl/year. The project maximum delivery assuming 250 trains/year @ 73 rail cars/train and 30,000 bbl/car =**13,035,714 bbl/year** or **73%** of the permitted throughput of **17,866,750 bbl/year**. DEIR, p. 2-26.

B. Tar Sands Crudes as Feedstock for the Santa Maria Refinery

Canadian tar sands crudes are a "North American sourced crude" that could be imported by the Rail Spur Project. These crudes are also chemically distinct from the current crude slate. The DEIR does not mention Canadian tar sands crudes, which we believe are the most likely crude source. They are likely not mentioned as tar sands crudes have numerous well documented environmental problems[14] and would not be welcome in California due to their well known adverse impacts. However, the Project design and various other information in the DEIR indicate the Project is being designed to import both tar sands crudes and Bakken crudes. Thus, the DEIR must be revised to evaluate the impacts of importing up to 100% of both crudes, which have different impacts. The evidence indicating the Project is designed to import tar sands crudes is summarized in this comment.

The Project description indicates the Rail Spur Project would import crude oil "sourced from oilfields throughout North America based on market economics and other factors..." DEIR, p. ES-3. Tar sands crudes are North American sourced crudes. Further, as defined by the International Energy Agency, and acknowledged in the Land Use Permit Application, the term "crude oil" comprises crude oil, natural gas liquids, refinery feedstocks, and additives as well as other hydrocarbons (including emulsified oils, synthetic crude oil, <u>mineral oils extracted from bituminous minerals such as oil shale, bituminous sand,</u> etc., and oils from coal liquefaction). Crude oil is a mineral oil consisting of a mixture of hydrocarbons of natural origin and associated impurities, such as sulphur.[15] The DEIR does not propose any condition excluding tar sands crudes. Thus, tar sands crudes cannot be ruled out. In fact, the Project is being designed to import tar sands crude. The evidence supporting this is outlined below.

1. <u>Tank Car Capacity</u>

The Project is designed to use two different sized rail cars in the unit trains: (1) 80 rail cars carrying 23,500 gallons each and (2) 73 railcars carrying 30,000 gallons each. DEIR ES-5. The capacity of a rail car is determined by the weight of the loaded car and the maximum allowed weight on the rail line, which is ultimately determined by the density of the material contained in the car. The maximum allowable weight on most freight rail lines coming out of Canada is 286,000 lbs, including the weight of the car.[16]

For light crudes, such as Bakken, the ideal rail tank car has a capacity of 30,000 to 32,000 gallons, given the 286,000 lb rail line weight restriction. For heavier crudes, such

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[14] EIP, Tar Sands: Feeding U.S. Refinery Expansions with Dirty Fuel, June 2008, Available at: http://environmentalintegrity.org/pdf/publications/Tar_Sand_Report.pdf.

[15] http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/phillipslanduse.pdf.

[16] Allowable Gross Weight Map, Available at: http://www.uprr.com/aboutup/maps/attachments/allow_gross_full.pdf. See also 49 CFR 179.13, Tank Car Capacity and Gross Weight Limitation.

as tar sands, the ideal tank car has a capacity of about 25,000 gallons, given this limit.[17] Thus, the Project described in the DEIR contemplates both Bakken and tar sands, as it describes the Project as using tank cars carrying either 23,500 gallons (a classic tar sands railcar) or 30,000 gallons (a classic light crude railcar) of crude oil. The Bakken train configuration option would allow the import of more crude than the permitted maximum daily crude throughput (51,143 BPD vs 48,950 BPD).

2. Hydrogen Sulfide Levels

The DEIR includes an odor impact analysis that assumes "the expected H_2S content of the crude oil vapor could be about one percent" based on the Applicant's expected H_2S content of crude oil vapor. DEIR, p. 4.3-51. This is much higher than H_2S levels in Bakken crude vapors. Bakken crude oil contains less than 0.2% H_2S and the headspace vapors would be significantly lower. Thus, the Applicant is expecting to import high H_2S crudes. Tar sands crudes contains high H_2S concentrations.[18]

3. Vapor Pressure Limits

Phillips 66 asserted in its responses to comments on the Draft EIR for the Propane Recovery Project at Rodeo that: "Prior to shipment of the intermediates produced at Santa Maria, the semi-refined material is stored in tankage. The tankage has vapor pressure limits imposed by the County Air District which acts as a constraint regarding how much butane/propane can be included in the intermediates. Accordingly... no new propane/butane can be added to the intermediates sent from Santa Maria to Rodeo regardless of the types of crude that may be processed at Santa Maria."[19] If true, this eliminates Bakken as a crude that would imported by the rail spur, as it contains high concentrations of volatile components that would significantly increase vapor pressure of material stored in tanks. This points to the import of tar sand crudes, which are similar to the heavy crudes currently refined at Santa Maria.

4. Cost-Advantaged Crudes

The DEIR indicates one of the purposes of the Project is to obtain "competitively priced crude oil." DEIR, p. 2-30. Tar sands and Bakken are both "competitively priced", cost-advantaged crudes because they are stranded, with no pipeline access and thus must be delivered by rail.[20] As refineries are not equipped to take delivery of large amounts of

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[17] Association of American Railroads, Moving Crude Petroleum by Rail, May 2013, p. 10.

[18] http://www.crudemonitor.ca/home.php.

[19] Letter from Mark E. Evans, Phillips 66 San Francisco Refinery Manager, to Chair Karen Mitchoff and Members of the Contra Costa County Board of Supervisors, Re: Phillips 66 Propane Recovery Project, p. 6, January 6, 2014, Available at: http://64.166.146.155/docs/2014/BOS/20140121_330/16707_Exhibit7-P66Response.pdf.

[20] Small amounts of Canadian tar sands crudes are currently arriving on the west coast by ship. However, the pipeline capacity to transport the tar sands crude to the west coast and the rail capacity to transport it to the west coast for subsequent water delivery is currently very limited. However, projects are underway to

crude by rail, which requires large unit trains, significant infrastructure improvements, such as the Santa Maria Rail Spur Project, are required to import them to the west coast. The most cost advantaged of those available is tar sands crudes, which are both closer to Santa Maria and have less value in the refining market due to their composition, which is similar to the heavy sour crudes now processed at Santa Maria.

Cost-advantaged crude sells at a discount relative to crude oils tied to the global benchmark, North Sea Brent crude. A recent presentation by a Phillips 66 competitor identified tar sands crudes as the most competitively priced crudes to import into the California market by rail.[21] The cost-advantaged crude oils identified by Valero are shown in Figure 4.

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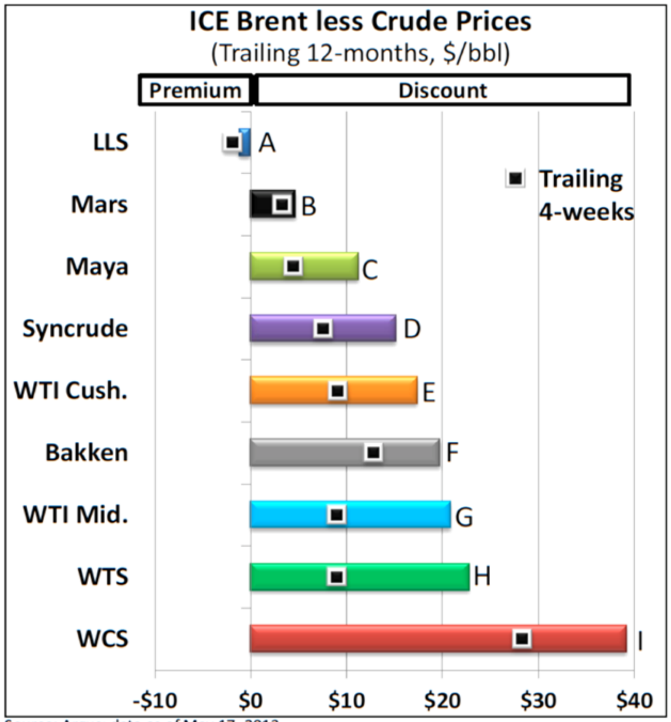
alleviate these bottlenecks, including a Phillips 66 project at its Ferndale facility in Washington. The Ferndale project would allow direct import of tar sands crude at the Rodeo Marine Terminal.

[21] Valero, UBS Global Oil and Gas Conference, May 21-22, 2013, p. 10, Available at: http://www.valero.com/InvestorRelations/Pages/EventsPresentations.aspx. provided as Appendix D to TGG Comments.

Figure 4
Cost-Advantaged Crudes
That Could Be Imported By Rail[22]

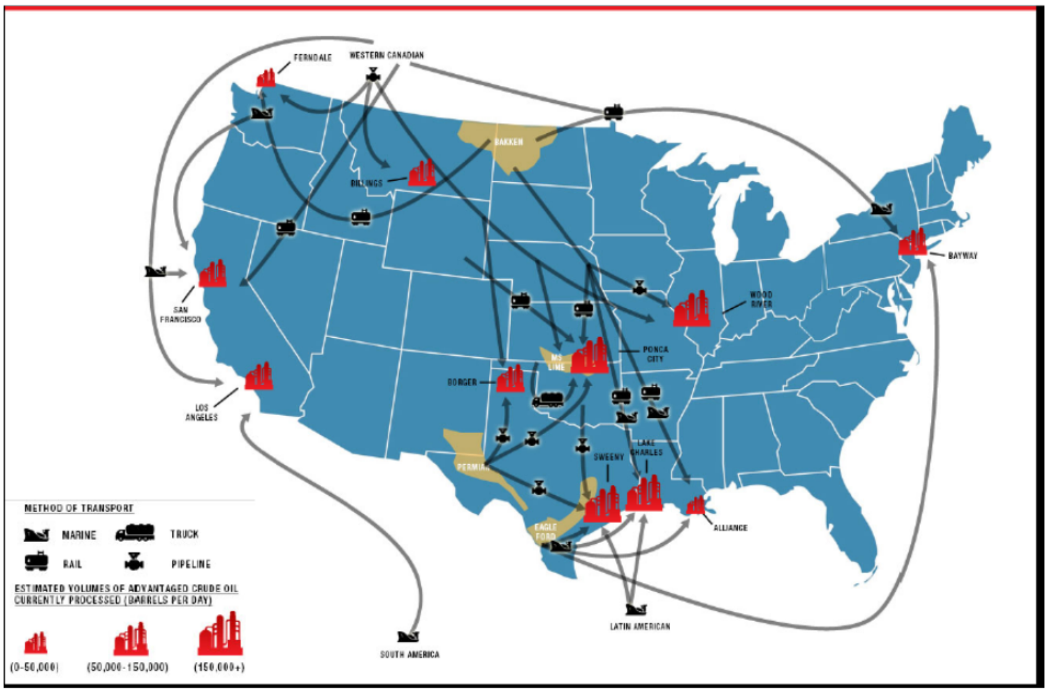


Source: Argus; data as of May 17, 2013

[22] **Brent** is light sweet crude oil sourced from the North Sea, priced at export point there. It has an API gravity of 37.9° and 0.45% sulfur. **LLS** is light Louisiana sweet, priced at St. James, LA. It has an API gravity of 37.0° and 0.38% sulfur. **MARS** is a medium sour blended crude marketed into the Gulf coast and mid-continent regions, priced at Clovelly LA. It has an API gravity of 28.7° and 1.8% sulfur. **Maya** is a heavy sour crude oil from Mexico, priced at export point there. It has an API gravity of 22° and 3.3% sulfur. **WTI Cush.** is West Texas Intermediate crude priced at Cushing, OK, a major trading hub for crude oil. It is a light crude oil with an API gravity of 39.0° and 0.4% sulfur (see also http://en.wikipedia.org/wiki/West_Texas_Intermediate). **WTI Mid**. is West Texas Intermediate (API gravity of 39.0° and 0.4% sulfur) priced at Midland TX (proximate to Permian Basin production). **WTS** is west Texas Sour priced at Midland, TX and an API gravity of 33.5° and 1.9% sulfur. **Syncrude** is a light sweet synthetic Canadian tar sands crude consisting of a bottomless blend of hydrotreated naphtha, distillate, and gas oil fractions produced from a coker and hydrocracker based upgrader facility in Canada; priced at Edmonton Alberta. It typically has an API gravity of 31.0° to 33.0° and 0.1% to 0.2% sulfur (see also http://www.crudemonitor.ca/crude.php?acr=SYN). **WCS** is Western Canadian Select, priced at Hardesty, Alberta. This is a tar sands DilBit crude with API gravity of 20.0° to 21.0° and 3.4% to 3.7% sulfur (see also http://www.crudemonitor.ca/crude.php?acr=WCS).
Sources: Valero crude price data (in Figure 2) are sourced to Argus, so crude specifications in this footnote are based on Argus Methodology and Specifications: Americas Crude (Last Updated: May 2013) http://media.argusmedia.com/~/media/Files/PDFs/Meth/argus_americas_crude.pdf and (for Brent) Argus Crude (Updated: June 2013) http://media.argusmedia.com/~/media/Files/PDFs/Meth/argus_crude.pdf, The pricing locations specified are those shown in Valero, UBS Global Oil and Gas Conference, May 21-22, 2013, p. 8, Available at: http://www.valero.com/InvestorRelations/Pages/EventsPresentations.aspx, provided as Appendix D to TGG Comments.

The largest growth in cost-advantaged crudes is coming from U.S. shale crudes and heavy Canadian tar sands crudes, both of which are "North American-sourced crude oils." Valero's list of cost-advantaged crudes in Figure 4 indicates that the most cost-advantaged crude is Western Canadian Select (WCS).[23] A recent Phillips 66 presentation, Figure 5, indicates it is clearly considering Canadian tar sands crude options.[24]

Figure 5
Phillips 66 Cost Advantaged Crude Activities



Western Canadian Select is a "DilBit", which is Canadian tar sands bitumen diluted to pipeline specifications with 25% to 30% diluent. The diluent is typically natural gas condensate, pentanes, or naphtha.[25] Most of the tar sands crudes are too heavy to flow in a pipeline or to be transported in the type of railcars proposed for the Project (i.e., no steam coils or steaming facilities at Santa Maria). Thus, they must be

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[23] Cenovus Energy, Western Canadian Select (WCS) Fact Sheet, Available at: http://www.cenovus.com/operations/doing-business-with-us/marketing/western-canadian-select-fact-sheet.html. See also CrudeMonitor.ca - Canadian Crude Quality Monitoring, Available at: http://www.crudemonitor.ca/crude.php?acr=WCS.

[24] Phillips 66, Crude by Rail & Intermodal Supply Chain, Optimization and Opportunities, Refiner-Led Summit 2013, Opening Keynote Panel, August 21, 2013.

[25] Gary R. Brierley, Visnja A. Gembicki, and Tim M. Cowan, Changing Refinery Configurations for Heavy and Synthetic Crude Processing, Available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BA07DE342-E9B1-402A-83F7-36B18DC3DD05%7D&documentTitle=5639138.

diluted or thinned with a lighter hydrocarbon stream to reduce viscosity and density to meet pipeline specifications.

The potential rail import of DilBits cannot be eliminated and is the most likely rail import due to economic considerations. The failure to disclose the potential import of tar sands crudes, which are chemically distinct from the current crude slate, is a significant omission as the emissions from handling this material are different from the baseline crude slate. The emissions of some pollutants, VOCs and HAPs, for example, are large and will result in significant air quality, odor, and worker and public health impacts.

Western Canadian Select sells for a discount of nearly \$40/bbl compared to ICE Brent.[26] Assuming Valero's reported light crude rail delivery cost of about \$13/bbl to \$15/bbl,[27] WCE would arrive at Santa Maria at a discount of about \$23/bbl to \$25/bbl relative to ICE Brent. Rail delivery costs for heavy crude would be somewhat higher, and heavy, sour crudes are less valuable than Brent (the global benchmark for light, sweet crudes). Still, the price of WCS delivered to Santa Maria is likely lower (and very likely competitive), compared with all the other cost-advantaged crudes (Fig. 4). Thus, the most likely crude to be imported by rail is one of the tar sands crudes, which are compatible with the design of the Santa Maria Refinery.

The cost advantage of delivering North American-sourced light sweet crudes (e.g., Bakken) by rail is less than for tar sands crudes. The North American light crudes are discounted less relative to conventional light sweet crudes (ICE Brent) as North American light crudes have more desirable qualities and are further away from Santa Maria than Canadian tar sands. The cost advantage of these crudes, e.g., Bakken, may be small (or completely disappear) after adding the cost of transport by rail to Santa Maria. However, the competitive position of Bakken (and other crudes) will depend in part on the pricing dynamics in the crude markets,[28] and also how specific refineries are configured.[29] Thus, Bakken cannot be eliminated and must be analyzed in the DEIR.

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[26] Brent crude is a major trading classification of sweet light crude oil sourced from the North Sea. Brent is the leading global price benchmark for Atlantic basin crude oils and is used to price two thirds of the world's internationally traded crude oil supplies. It contains about 0.37% sulfur and has an API gravity of 38.06°. It is traded on the electronic IntercontinentalExchange, know as ICE. See: http://en.wikipedia.org/wiki/Brent_Crude.

[27] Valero, May 21-22, 2013, p. 11. This is consistent with recently reported rail delivery rates to Los Angeles of \$9.50 - \$10.50/bbl (Tesoro, Deutsche Bank Energy Conference, January 9, 2014, pdf 14).

[28] Crude pricing is highly dynamic and varies in part based on crude flows. To the extent that California (and other North American coastal markets) are importing Brent and other waterborne crudes, delivered costs typically include a small premium to cover the cost of importing the crudes by tanker. In Valero's analysis in Figure 4, Brent-priced crude is assumed to be imported into East Coast US (PA/NJ), with the delivered price there at a \$2 premium over Brent. Market analysis typically assumes that overseas tanker delivery (e.g., from Brent to East or Gulf Coast) costs about \$2/barrel.

[29] Bakken and other light, sweet shale crudes are especially attractive for less complex refineries that are configured for light, sweet crudes, as opposed to more complex refineries that can process heavier, sour feedstocks.

IV. ENVIRONMENTAL IMPACTS FROM CRUDE SLATE CHANGES NOT EVALUATED

The Project would replace up to 100% of the current crude slate with crudes imported from other unidentified and chemically distinct sources, e.g., Bakken light sweet crudes or Canadian tar sands crudes. The environmental impacts of refining depend upon the composition of the crude slate, as discussed elsewhere in these comments. The specific chemicals emitted during refining depend upon the chemicals in the starting crude. Thus, the composition of the baseline crude slate is essential to determine environmental impacts.

A. Why Crude Slate Composition Matters

The Project proposes to dramatically change 100% of the crude slate, from heavy high sulfur locally sourced crudes to light low sulfur crude or heavy high sulfur tar sands crudes. However, the DEIR is silent on the composition of these new crude(s) that would be imported by rail and the resulting impacts relative to the baseline crude slate. The composition of the crude slate determines air quality, worker and public heath, risk of upset, and other impacts of the Project and must be disclosed. The specific chemicals emitted during refining depend upon the chemicals in the starting crude. Thus, the composition of the baseline crude slate is essential to determine environmental impacts.

Volatile chemicals in the crude, such as benzene, hydrogen sulfide, and mercaptans, for example, are emitted from tanks, pumps, connectors, and valves that transport, store and process the crude. Total crude sulfur content as reported in the DEIR cannot be used to evaluate odor and health impacts from transport, storing, and processing this crude as the impacts depend upon the concentration of specific sulfur compounds in rail-imports versus the current slate, e.g., the amount of hydrogen sulfide and mercaptans, which most commonly cause odor problems at refineries. The DEIR does not relate even the single crude analysis to any of its impact analyses. In fact, the DEIR did not analyze any of the impacts of a crude switch.

Hazardous air pollutants or HAPs (e.g., benzene) and other Toxic Air Contaminants (TACs (e.g., H_2S) are present in the crude slate and its semi-refined byproducts. These are emitted from thousands of fittings, valves, pumps, compressors, vents, and tanks at the Refinery and along the pipeline connecting Santa Maria and Rodeo. These emissions were not evaluated in the DEIR.

Refining rearranges the composition of the crude to make marketable products. This requires the input of electricity, heat, and steam. These are generated by burning fuel, which releases large amounts of greenhouse gases, nitrogen oxides (NOx), sulfur oxides (SOx), and other chemicals of concern. The amount of electricity, heat and steam depend upon the chemicals in the crude. Some of the potential "North American sourced crudes" may require much more electricity, heat, and steam to refine than the current slate, increasing emissions and other impacts relative to the baseline crude slate.

B. Crude Slate Baseline Is Not Identified

As this Project involves replacing up to 100% of the current crude slate with dramatically different crudes, baseline crude composition must be reported and impacts must be estimated for the crude switch, relative to baseline crudes. The DEIR does not include baseline crude composition nor does it evaluate any environmental impacts resulting from importing a new crude slate.

The DEIR only includes one analysis of a current crude, a sample collected in March 2008, which is not even in the baseline years and is incomplete. See Table 1. It is unknown where the sample was collected, how it was analyzed, and how it relates to the long-term average slate in the baseline years 2010 - 2012. The Santa Maria Refinery processes crudes from many local and offshore sources that change over time. Is the sample in Table 1 of just one of these crudes, or is it the typical blend that is refined in the baseline? Regardless, one snapshot sample is not sufficient to establish the 2010 - 2012 baseline crude composition.

Further, the reported crude sample data is just for gross lumped parameters such as API gravity and total sulfur content. These lumped parameters are not useful for evaluating environmental impacts. The specific chemicals in the crude and their concentrations are required to evaluate impacts. A good crude assay is essential for comprehensive crude oil evaluation.[30] The type of data required to evaluate emissions would require, at a minimum, the following information for both the current slate and the unidentified "North American-sourced crudes":

- Trace elements (As, B, Cd, Cl, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, Se, U, V, Zn)
- Nitrogen (total & basic)
- Sulfur (total, mercaptans, H_2S)
- Residue properties (saturates, aromatics, resins)
- Acidity
- Aromatics content
- Asphaltenes (pentane, hexane and heptane insolubles)
- Hydrogen content
- Carbon residue (Ramsbottom, Conradson)
- Distillation yields
- Properties by cut

[30] CCQTA February 7, 2012, p. 10.

- Hydrocarbon analysis by gas chromatography
- Flammability

This type of information is reported in a crude assay or "fingerprint" of the oil, which are likely available to Phillips 66 but were excluded from the DEIR, foreclosing any meaningful public review of environmental impacts. The DEIR does not identify any specific "North American-sourced crudes" that would be imported, contains only a single, limited crude assay for the current refinery slate which is inadequate to assess the baseline (a 2 year period, not a snapshot sample), or the crude(s) that would be imported by rail. The DEIR also does not contain an analysis of the impact of changes in crude quality on air emissions, odor impact, worker and public health impact, risk of upset, and other impact areas. Thus, the public is left to guess what the impacts might be.

The DEIR should have evaluated the impacts of refining the alternate crude slates the Project is being designed for, as reflected in the unit train specifications. These include both light sweet Bakken and heavy sour tar sands crudes. Alternatively, the DEIR should evaluate these impacts and include mitigation conditions prohibiting their import as publicly available information indicates that Phillips 66 is considering both as they would likely arrive at the Refinery with pricing that is competitive relative to other crudes.

The specific chemicals in the crude, for example, determine which ones will be volatile and lost through equipment leaks and outgassed from tanks, which ones will be difficult to remove at Santa Marian and Rodeo (thus determining how much hydrogen and energy must be expended to remove them), which ones will cause malodors, and which ones might aggravate corrosion, leading to accidental releases from pipelines and other refinery equipment.

V. SIGNIFICANT IMPACTS OF CRUDE SLATE CHANGES NOT DISCLOSED

The Project would change up to 100% of the baseline crude slate from locally sourced heavy high sulfur crudes to a light low sulfur crude or heavy high sulfur tar sands crudes. None of the impacts of the crude switch were disclosed in the DEIR nor any of the information required to assess these impacts.

A. Impacts From Unique Suite Of Sulfur Compounds Not Evaluated

The DEIR reports the amount of total sulfur in a single sample of a currently refined crude. The DEIR also analyzes the odor impacts of unloading an unidentified crude, assuming a crude vapor concentration of 1% H_2S (9600 ppm). DEIR, p. 4.3-51 and Appx. B, p. B-10. The basis for this assumption, e.g., the type of crude and the identification and concentration of all sulfur compounds in its vapors were not disclosed. Odor impacts were just evaluated for unloading, but nowhere else, e.g., crude tanks at the Refinery, processing units within the Refinery. Worker and public health impacts from emissions of sulfur species were not identified nor were risk of accidents from sulfur-induced corrosion.

The DEIR's assumption that 100% of the sulfur is H_2S is wrong. Sulfur in the potential import crudes comprises a complex collection of individual chemical compounds including hydrogen sulfide, mercaptans, thiophene, benzothiophene, methyl sulfonic acid, dimethyl sulfone, thiacyclohexane, etc. Each crude has a different suite of individual sulfur chemicals. The environmental impacts of "sulfur", including odor, health impacts and risk of upset, depend upon the specific sulfur chemicals and their relative concentrations, not on the "gross" amount of total sulfur expressed as weight percent sulfur in the crude oil, or only as H_2S in unidentified crude vapors.

The role of specific sulfur compounds was clearly and tragically demonstrated in the recent (August 2012) catastrophic accident at the Chevron Richmond Refinery. This accident was caused by the erroneous assumption that sulfur is sulfur, which led to significant corrosion. See next comment. Similarly, while the lighter sulfur compounds such as mercaptans and disulfides found in light sweet crudes may not significantly increase the overall weight percent sulfur in the crude slate, they do lead to impacts, such as aggressive sulfidation corrosion, which can lead to accidental releases. These compounds concentrate in the lower boiling naphtha fractions produced at Santa Maria and would contribute to aggressive sulfidation corrosion in the convection section of naphtha hydrotreating furnaces at Rodeo.[31]

The specific sulfur compounds in a crude also will determine which compounds will be emitted from storage tanks and fugitive component, some of which could result in significant odor impacts, e.g., mercaptans, and health impacts. The DEIR is silent on sulfur speciation, lumping all sulfur into only H_2S. DEIR, pp. 4.3-51, B-5.

Regardless of what crude might be brought in by rail, there are potentially significant environmental impacts that will result due to the unique sulfur speciation profile of each crude that have not been disclosed in the DEIR. The DEIR lumps all sulfur compounds together.

B. Accidental Releases From The Refinery May Increase

The Santa Maria Refinery was built in 1955 before current American Petroleum Institute (API) standards were developed to control corrosion and before piping manufacturers began producing carbon steel in compliance with current metallurgical codes. Thus, the metallurgy used throughout much of the Refinery is likely not adequate to handle the unique chemical composition of tar sands crudes without significant upgrades. There is no assurance that required metallurgical upgrades would occur if tar sands crudes dominate the crude slate, as they are very expensive and are not required by any regulatory framework. Experience with changes in crude slate at the Chevron

[31] See, for example, Jim McLaughlin, Changing Your Crude Slate, Becht New, May 24, 2013, Available at: http://becht.com/news/becht-news/.

Refinery in Richmond suggest required metallurgical upgrades are ignored, leading to catastrophic accidents.[32] The DEIR is silent on corrosion issues and metallurgical conditions of the Refinery.

Both DilBit and SynBit crudes, which are cost-advantaged North American crudes that could be imported by rail, have high Total Acid Numbers (TAN), which indicates high organic acid content, typically naphthenic acids. These acids are known to cause corrosion at high temperatures, such as occur in many refining units, e.g., in the feed to cokers. As a rule-of-thumb, crude oils with a TAN number greater than 0.5 mgKOH/g[33] are considered to be potentially corrosive and indicates a level of concern. A TAN number greater than 1.0 mgKOH/g is considered to be very high. Canadian tar sands crudes are high TAN crudes. The DilBits, for example, range from 0.98 to 2.42 mgKOH/g.[34]

Sulfidation corrosion from elevated concentrations of sulfur compounds in some of the heavier distillation cuts is also a major concern, especially in the vacuum distillation column, coker, and hydrotreater units. The specific suite of sulfur compounds may lead to increased corrosion. The IS/MND did not disclose either the specific suite of sulfur compounds or the TAN for the proposed crude imports.

A crude slate change could result in corrosion from, for example, the particular suite of sulfur compounds or naphthenic acid content, that leads to significant accidental releases, even if the crude slate is within the current design slate basis, due to compositional differences.

This recently occurred at the Chevron Richmond Refinery in the San Francisco Bay. This refinery gradually changed crude slates, while staying within its established crude unit design basis for total weight percent sulfur of the blended feed to the crude unit. The sulfur composition at Chevron Richmond significantly changed over time.[35] This change increased corrosion rates in the 4-sidecut line, which led to a catastrophic pipe failure in the #4 Crude Unit on August 6, 2012. This release sent 15,000 people from the surrounding area for medical treatment due to the release and created huge black clouds of pollution billowing across the San Francisco Bay.

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[32] U.S. Chemical Safety and Hazard Investigation Board, Interim Investigation Report, Chevron Richmond Refinery Fire, Chevron Richmond Refinery, Richmond, California, August 6, 2012, Draft for Public Release, April 15, 2013, Available at: http://www.csb.gov/chevron-refinery-fire/.

[33] The Total Acid Number measures the composition of acids in a crude. The TAN value is measured as the number of milligrams (mg) of potassium hydroxide (KOH) needed to neutralize the acids in one gram of oil.

[34] www.crudemonitor.ca.

[35] US Chemical Safety and Hazard Investigation Board, 2013, p.34 ("While Chevron stayed under its established crude unit design basis for total wt. % sulfur of the blended feed to the crude unit, the sulfur composition significantly increased over time. This increase in sulfur composition likely increased corrosion rates in the 4-sidecut line.").

These types of accidents can be reasonably expected to result from incorporating tar sands crudes into crude oils processed at the SMR. Even if the range of sulfur and gravity of the crudes remains the same, unless significant upgrades in metallurgy occur, as these crudes have a significant concentration of sulfur in the heavy components of the crude coupled with high TAN and high solids, which aggravate corrosion. The gas oil and vacuum residue piping, for example, may not be able to withstand naphthenic acid or sulfidation corrosion from tar sands crudes, leading to catastrophic releases.[36] Catastrophic releases of air pollution from these types of accidents were not considered in the IS/MND.

Refinery emissions released in upsets and malfunctions can, in some cases, be greater than total operational emissions recorded in formal inventories. For example, a recent investigation of 18 Texas oil refineries between 2003 and 2008 found that "upset events" were frequent, with some single upset events producing more toxic air pollution than what was reported to the federal Toxics Release Inventory database for the entire year.[37]

C. Emissions From Diluent Were Not Evaluated

The majority of the crudes that will be imported by rail will likely be a blend of bitumen and diluent due to their discounted price compared to conventional light sweet crudes such as Bakken. Pure undiluted tar sands bitumen is unlikely as the Project description does not disclose any equipment that would be necessary to handle pure bitumen, e.g., rail cars with steam soils, steaming facilities. Undiluted bitumen would eliminate the diluent impacts discussed in this section, but would significantly increase the impacts from refining the heavy ends from increased use of utilities that increase combustion emissions. Setting aside undiluted bitumen, this leaves the question of the amount of diluent that would be mixed with the crude, which ultimately determines impacts.

When heavy crude is shipped by pipeline, it needs to be diluted so that it will flow in the pipe. Bitumen blended to pipeline specifications can be loaded on and off conventional rail tank cars like other light crudes. However, bitumen can also be transported by rail as "RailBit", using 15% to 20% diluent. The amount of diluent depends on the type of rail tank car and design details of the offloading facilities, which are not disclosed in the DEIR, which suggests conventional rail cars designed for DilBits and a conventional unloading terminal. Thus, I assume that one of the materials that will be transported by rail is conventional pipeline-quality DilBits with 20% to 30% diluent.

The mixture of diluent and bitumen does not behave the same as a conventional heavy crude, such as present in the current crude slate, because the distribution of hydrocarbons is very different. The blended lighter diluent generally evaporates readily

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[36] See, for example, Turini and others, 2011.

[37] J. Ozymy and M.L. Jarrell, Upset over Air Pollution: Analyzing Upset Event Emissions at Petroleum Refineries, Review of Policy Research, v. 28, no. 4, 2011.

when exposed to ambient conditions, leaving behind the heavy ends, the vacuum gas oil (VGO) and residuum.[38] Thus, when a DilBit is released accidentally, it will generally create a difficult to cleanup spill as the heavier bitumen will be left behind.[39] Further, in a storage tank, the diluent also can be rapidly evaporated and emitted through tank openings, emitting high amounts of VOCs and HAPs.

These conventional DilBits, which are the most likely "North American-sourced crudes" to be imported by rail over the long term, given the current economic outlook, are sometimes referred to as "dumbbell" or "barbell" crudes as the majority of the diluent is C_5 to C_{12} and the majority of the bitumen is C_{30}+ boiling range material, with very little in between.[40] This means these crudes have a lot of material boiling at each end of the boiling point curve, but little in the middle. Thus, they yield very little middle distillate fuels, such as diesel, heating oil, kerosene, and jet fuel and more coke, than other heavy crudes. A typical DilBit, for example, will have 15% to 20% by weight light material, basically the added diluent, 10% to 15% middle distillate, and the balance, >75% is heavy residual material (vacuum gas oil and residue) exiting the distillation column. These characteristics distinguish DilBits from crudes currently refined at Santa Maria.[41] Thus, they could generate more coke than the current crude slate, which was not disclosed in the DEIR.

The large amount of light material that distills below 149 C is very volatile and can be emitted to the atmosphere from storage tanks and equipment leaks of fugitive components (pumps, compressors, valves, fittings) in much larger amounts than other heavy crudes that it would replace. The DEIR does not indicate whether other heavy crudes processed at the Refinery currently arrive with diluent. Thus, the use of diluent to transport tar sands crudes is likely an important difference between the current heavy crude slates processed at the Refinery and the tar sands crudes that could replace them. This diluent will have impacts during railcar unloading as well as within the Refinery.

The diluent is a low molecular weight organic material with a high vapor pressure that contains high levels of VOCs, sulfur compounds, and HAPs. These would be emitted during unloading and present in emissions from the crude tank(s) and fugitive components from its entry into the Refinery with the crude until it is recovered and marketed at Rodeo. The presence of diluent would increase the vapor pressure of the

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[38] The residuum is the residue obtained from the oil after nondestructive distillation has removed all of the volatile materials. Residua are black, viscous materials. They may be liquid at room temperature (from the atmospheric distillation tower) or almost solid (generally vacuum residua), depending upon the nature of the crude oil.

[39] A Dilbit Primer: How It's Different from Conventional Oil, Inside Climate News. Available at: http://insideclimatenews.org/news/20120626/dilbit-primer-diluted-bitumen-conventional-oil-tar-sands-Alberta-Kalamazoo-Keystone-XL-Enbridge?page=show.

[40] Gary R. Brierley and others, Changing Refinery Configuration for Heavy and Synthetic Crude Processing, 2006, Available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BA07DE342-E9B1-402A-83F7-36B18DC3DD05%7D&documentTitle=5639138.

[41] Stratiev and others, 2010, Table 1, compared to DilBit crude data on www.crudemonitor.ca.

crude, substantially increasing VOC and HAP emissions from tanks and fugitive component leaks compared to those from displaced heavy crudes not blended with diluent and does not address diluent-derived emissions.

The composition of some typical diluents/condensates is reported on the website, www.crudemonitor.ca.[42] The specific diluents that would be present in imported crudes is unknown. The CrudeMonitor information indicates that diluents contain very high concentrations (based on 5-year averages, v/v basis) of the hazardous air pollutants (HAPs) benzene (7,200 ppm to 9,800 ppm); toluene (10,300 ppm to 25,300 ppm); ethyl benzene (900 ppm to 2,900 ppm); and xylenes (4,600 ppm to 23,900 ppm).

The sum of these four compounds is known as "BTEX" or benzene-toluene-ethylbenzene-xylene. The BTEX in diluent ranges from 27,000 ppm to 60,900 ppm. The BTEX in DilBits, blended from these materials, ranges from 8,000 ppm to 12,300 ppm.[43] Similarly, the BTEX in synthetic crude oils (SCOs) ranges from 6,100 ppm to 14,100 ppm.[44] These are very high concentrations that were not considered in the emission calculations in the DEIR or the health risk assessment. These high levels could result in significant worker and public health impacts.

The DEIR does not disclose the BTEX concentrations in the baseline crude slate nor the BTEX concentrations in the range of crudes that could be imported. Rather, it contains only a single mass fraction crude vapor speciation profile that is used only to estimate canister ROG emissions from unloading of trains. However, BTEX from the crude would be emitted from nearly every tank and fugitive component in the Refinery. The DEIR did not evaluate the worker or public health impacts from these emissions anywhere at the facility. Benzene is a carcinogen, the principal one that would be

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[42] Condensate Blend (CRW) - http://www.crudemonitor.ca/condensate.php?acr=CRW; Fort Saskatchewan Condensate (CFT) - http://www.crudemonitor.ca/condensate.php?acr=CFT; Peace Condensate (CPR) - http://www.crudemonitor.ca/condensate.php?acr=CPR; Pembina Condensate (CPM) - http://www.crudemonitor.ca/condensate.php?acr=CPM; Rangeland Condensate (CRL) - http://www.crudemonitor.ca/condensate.php?acr=CRL; Southern Lights Diluent (SLD) - http://www.crudemonitor.ca/condensate.php?acr=SLD.

[43] DilBits: Access Western Blend (AWB) - http://www.crudemonitor.ca/crude.php?acr=AWB; Borealis Heavy Blend (BHB) - http://www.crudemonitor.ca/crude.php?acr=BHB; Christina Dilbit Blend (CDB) - http://www.crudemonitor.ca/crude.php?acr=CDB; Cold Lake (CL) - http://www.crudemonitor.ca/crude.php?acr=CL; Peace River Heavy (PH) - http://www.crudemonitor.ca/crude.php?acr=PH; Seal Heavy (SH) - http://www.crudemonitor.ca/crude.php?acr=SH; Statoil Cheecham Blend (SCB) - http://www.crudemonitor.ca/crude.php?acr=SCB; Wabasca Heavy (WH) - http://www.crudemonitor.ca/crude.php?acr=WH; Western Canadian Select (WCS) - http://www.crudemonitor.ca/crude.php?acr=WCS; Albian Heavy Synthetic (AHS) (DilSynBit) - http://www.crudemonitor.ca/crude.php?acr=AHS.

[44] SCOs: CNRL Light Sweet Synthetic (CNS) - http://www.crudemonitor.ca/crude.php?acr=CNS; Husky Synthetic Blend (HSB) - http://www.crudemonitor.ca/crude.php?acr=HSB; Long Lake Light Synthetic (PSC) - http://www.crudemonitor.ca/crude.php?acr=PSC; Premium Albian Synthetic (PAS) - http://www.crudemonitor.ca/crude.php?acr=PAS; Shell Synthetic Light (SSX) - http://www.crudemonitor.ca/crude.php?acr=SSX; Suncor Synthetic A (OSA) - http://www.crudemonitor.ca/crude.php?acr=OSA; Syncrude Synthetic (SYN) - http://www.crudemonitor.ca/crude.php?acr=SYN.

emitted by the Project.[45] These emissions would results in significant worker and public health impacts.

Table 2
Comparison of BTEX Levels
in Potential Crude Imports

	Current Crude Slate (in crude vapors) DEIR, p. B-5 (wt.%)[46]	Diluents (5-yr Avg)[47] (wt.%)	Christina DilBit[48] (5-yr Avg) (wt.%)	Western Canadian Select[49] (5-yr Avg) (wt.%)	Bakken[50] Crude (wt.%)
Benzene	?	0.83-1.27	0.27	0.15	0.1-1.0
Ethylbenzene	?	0.11-0.33	0.06	0.06	0.33
Toluene	?	1.32-2.89	0.44	0.27	0.92
Xylenes	?	0.59-2.71	0.34	0.27	1.4

The CrudeMonitor information also indicates that these diluents contain elevated concentrations of volatile mercaptans (9.9 to 103.5 ppm), which are highly odiferous and toxic compounds that will create odor and nuisance problems at the Refinery in the vicinity of the unloading area, crude storage tanks and supporting fugitive components. Mercaptans can be detected at concentrations substantially lower than will be present in emissions from the crude tanks and fugitive emissions from the unloading rack and

[45] Ethylbenzene was classified by OEHHA as a weak carcinogen in 2007. See: http://oehha.ca.gov/tcdb/index.asp.

[46] DEIR did not report BTEX composition of the crudes.

[47] The reported range includes the following diluents: Condensate Blend, Saskatchewan Condensate, Peace Condensate, Pembina Condensate, Rangeland Condensate, and Southern Lights Diluent. The composition data for all of these diluents is found at http://www.crudemonitor.ca. Concentrations reported in volume % (v/v) in this source were converted to weight % by dividing by the ratio of compound density in kg/m^3 at 25 C (benzene =876.5 kg/m^3, toluene = 0.866.9 kg/m^3, ethylbenzene 866.5 kg/m^3, and the xylenes 863 kg/m^3) to crude oil density in kg/m3, as reported at www.crudemonitor.ca, 5-year average. See also Cenovus Energy Inc. Material Safety Data Sheet, Condensate (Sour) and Condensate (Sweet), Available at: http://www.cenovus.com/contractor/msds.html.

[48] Christina DilBit Blend (CDB) -.http://www.crudemonitor.ca/crude.php?acr=CDB. Concentrations reported in volume % (v/v) converted to weight % as explained in footnote 47.

[49] Western Canadian Select (WCS) - http://www.crudemonitor.ca/crude.php?acr=WCS. Concentrations reported in volume % (v/v) converted to weight % as explained in footnote 47.

[50] Cenovus Energy, Material Safety Data Sheet for Light Crude Oil, Bakken (benzene), Available at: http://www.cenovus.com/contractor/docs/CenovusMSDS_BakkenOil.pdf. Other components of BTEX from Keystone DEIS, Tables 3.13-1 (density) and 3.13-2 (BTEX). Concentrations reported in volume % (v/v) converted to weight % as explained in footnote 47.

related components, including pumps, valves, flanges, and connectors.[51] In fact, mercaptans are added to natural gas in very tiny amounts so that the gas can be smelled to facilitate detecting leaks.

Thus, unloading, storing, handling and refining bitumens mixed with diluent and shale crudes such as Bakken would emit VOCs, HAPs, and malodorous sulfur compounds, not found in comparable levels in the existing slate of heavy high sulfur local crudes, depending upon the rail-imported DilBit or shale crude source. There are no restrictions on the crudes, diluent source or their compositions nor any requirements to monitor emissions from tanks and leaking equipment where DilBit-blended and other light crudes would be handled.

D. Increased Combustion Emissions From Tar Sands Bitumen Not Evaluated

Tars sands are one group of crudes that could plausibly be imported by rail, as discussed elsewhere in these comments. The composition of tar sands crudes is chemically different from other heavy crudes currently processed at the Refinery as they are tar sands bitumen mixed with diluent. They are unique for two major reasons: (1) presence of large quantities of volatile diluent full of VOCs and toxic chemicals as discussed above and (2) unique chemical composition of the bitumen, the heavy fraction. The previous comment discussed diluent. This comment discusses the unique composition of tar sands bitumens that require more intense processing and thus result in higher emissions.

Tar sands bitumens are composed of higher molecular weight chemicals and are deficient in hydrogen compared to conventional heavy crudes. This means more energy will be required to convert them into the same slate of refined products. Thus, most fired sources in both the Santa Maria and Rodeo Refiners —heaters, boilers, etc.—will have to work harder to generate the same quantity and quality of refined products. This will increase all utilities required to run the refineries - electricity, natural gas, hydrogen, water, and steam. These increases in emissions were not disclosed in the DEIR. This section discusses these bitumens and their impact on refining emissions.

Refining converts crude oils into transportation fuels. This is done by removing contaminants (sulfur, nitrogen, metals) and breaking down and reassembling chemicals present in the crude oil charge by adding hydrogen, removing carbon as coke, and applying heat, pressure, and steam in the presence of various catalysts. More intensive refining is required to convert tar sands crudes into useful products than other heavy crudes. This means a greater amount of energy must be expended to yield the same product slate. Thus, all of the combustion sources in a refinery, such as heaters and boilers, must work harder and thus emit more pollutants, than when refining conventional heavy and other crudes. The DEIR fails completely to analyze the impact of crude

[51] American Industrial Hygiene Association, Odor Thresholds for Chemicals with Established Occupational Health Standards, 1989; American Petroleum Institute, Manual on Disposal of Refinery Wastes, Volume on Atmospheric Emissions, Chapter 16 - Odors, May 1976, Table 16-1.

composition on the resulting emissions from generating increased amount of these utilities.

Canadian tar sands bitumen is distinguished from conventional petroleum by the small concentration of low molecular weight hydrocarbons and the abundance of high molecular weight polymeric material.[52] Crudes derived from Canadian tar sands bitumen—DilBits, SCOs and SynBits—are heavier, i.e., have larger, more complex molecules such as asphaltenes,[53] some with molecular weights above 15,000.[54] They generally have higher amounts of coke-forming precursors; larger amounts of contaminants (sulfur, nitrogen nickel, vanadium) that require more intense processing to remove; and are deficient in hydrogen, compared to other heavy crudes.

Thus, to convert them into the same refined products requires more utilities -- electricity, water, heat, and hydrogen. This requires that more fuel be burned in most every fired source at a refinery and that more water be circulated in heat exchangers and cooling towers. Further, this requires more fuel to be burned in any supporting off-site facilities. Under CEQA, these indirect increases in emissions caused by a project must be included in the impact analysis. These increases in fuel consumption release increased amounts of NO_x, SO_x, VOCs, CO, PM10, PM2.5, and HAPs as well as greenhouse gas emissions (GHG). Some of the principal differences are identified below, followed by a discussion of the impacts these differences have on emissions.

1. <u>Higher Concentrations of Asphaltenes and Resins</u>

The severity (e.g., temperature, amount of catalyst, hydrogen) of hydrotreating depends on the type of compound a contaminant is bound up in. Lower molecular weight compounds are easier to remove. The difficulty of removal increases in this order: paraffins, naphthenes, and aromatics.[55] Most of the contaminants of concern in tar sands crudes are bound up in high molecular weight aromatic compounds such as asphaltenes that are difficult to remove, meaning more heat, hydrogen, and catalyst are required to convert them to lower molecular weight blend stocks. Some tar sands-derived vacuum gas oils (VGOs), for example, contain no paraffins of any kind. All of the molecules are

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[52] O.P. Strausz, The Chemistry of the Alberta Oil Sand Bitumen, Available at: http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/22_3_MONTREAL_06-77_0171.pdf.

[53] Asphaltenes are nonvolatile fractions of petroleum that contain the highest proportions of heteroatoms, i.e., sulfur, nitrogen, oxygen. The asphaltene fraction is that portion of material that is precipitated when a large excess of a low-boiling liquid hydrocarbon such as pentane is added. They are dark brown to black amorphous solids that do not melt prior to decomposition and are soluble in benzene and aromatic naphthas.

[54] O.P. Strausz, The Chemistry of the Alberta Oil Sand Bitumen, Available at: http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/22_3_MONTREAL_06-77_0171.pdf.

[55] Gary et al., 2007, p. 200.

aromatics, naphthenes, or sulfur species that require large amounts of hydrogen to hydrotreat, compared to other heavy crudes.[56]

Asphaltenes and resins generally occur in tar sands bitumens in much higher amounts than in other heavy crudes. They are the nonvolatile fractions of petroleum and contain the highest proportions of sulfur, nitrogen, and oxygen.[57] They have a marked effect on refining and result in the deposition of high amounts of coke during thermal processing in the coker. They also form layers of coke in hydrotreating reactors, such as those at Rodeo, requiring increased heat input, leading to localized or even general overheating and thus even more coke deposition. This seriously affects catalyst activity resulting in a marked decrease in the rate of desulfurization. They also require more intense processing in the coker required to break them down into lighter products. These factors require increases in steam and heat input, both of which generate combustion emissions -- NO_x, SO_x, CO, VOCs, PM10, and PM2.5.

Further, if the crude includes a synthetic crude, SCO, for example, the material has been previously hydrotreated. Thus, the remaining contaminants (e.g., sulfur, nitrogen), while present in small amounts, are much more difficult to remove (due to their chemical form, buried in complex aromatics), requiring higher temperatures, more catalyst, and more hydrogen.[58]

The higher amounts of asphaltenes and resins generate more heavy feedstocks that require more severe processing than lighter feedstocks. The coker, for example, makes more coker distillate and gas oil, that would contribute to the propane and butane that would be recovered at Rodeo, compared to conventional heavy crudes. Similarly, the Crude Unit makes more atmospheric and vacuum gas oils that would be sent to Rodeo,[59] increasing emissions there, including fugitive VOC emissions from equipment leaks and combustion emissions from burning more fuel.

2. Hydrogen Deficiency

Tar sands crudes are hydrogen-deficient compared to heavy and conventional crude oils and thus require substantial hydrogen addition during refining, beyond that required to remove contaminants (sulfur, nitrogen, metals) from non-tar-sands crudes. This again means more combustion emissions from burning more fuel. As the refining processes that use hydrogen, e.g., hydrotreating, are all located at Rodeo, this is further

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[56] See, for example, the discussion of hydrotreating and hydrocracking of Athabasca tar sands cuts in Brierley et al. 2006, pp. 11-17.

[57] James G. Speight, The Desulfurization of Heavy Oils and Residua, Marcel Dekker, Inc., 1981, Tables 1-1, 2-2, 2-3, 2-4 and p. 13 and James G. Speight, Synthetic Fuels Handbook: Properties, Process, and Performance, McGraw-Hill, 2008, Tables A.2, A.3, and A.4.

[58] See, for example, Brierley et al. 2006, p. 8 ("The sulfur and nitrogen species left in the kerosene and diesel cuts are the most refractory, difficult-to-treat species that could not be removed in the upgrader's relatively high-pressure hydrotreaters."); Turini et al. 2011 p. 4.

[59] See, for example, Turini et al. 2011, p. 9.

evidence that a crude slate switch involving tar sands would necessarily be directly linked to Rodeo.

3. Higher Concentrations of Catalyst Contaminants

Tar sands bitumens contain about 1.5 times more sulfur, nitrogen, oxygen, nickel and vanadium than typical heavy crudes.[60] Thus, much more hydrogen per barrel of feed and higher temperatures would be required at Rodeo to remove the larger amounts of these poisons from semi-refined products. These impurities are removed by reacting hydrogen with the crude fractions over a fixed catalyst bed at elevated temperature. The oil feed is mixed with substantial quantities of hydrogen either before or after it is preheated, generally to 500 F to 800 F. The amount of hydrogen required for a particular application depends on the hydrogen content of the feed and products and the amount of the contaminants to be removed. Hydrogen consumption is typically about 70 standard cubic foot per barrel (scf/bbl) of feed per percent sulfur, about 320 scf/bbl feed per percent nitrogen, and 180 scf/bbl per percent oxygen removed.[61]

Canadian tar sands crudes generally have higher nitrogen content, 3,000 to >6,000 ppm[62] and specifically higher organic nitrogen content, particularly in the naphtha range, than other heavy crudes.[63] This nitrogen is mostly bound up in complex aromatic compounds that require a lot of hydrogen to remove. This would affect emissions at Rodeo in five ways.

First, additional hydrotreating is required to remove them, which increases hydrogen and energy input. Second, they deactivate the cracking catalysts, which requires more energy and hence more emissions to achieve the same end result. Third, they increase the nitrogen content of the fuel gas fired in combustion sources, which increases NO_x emissions from all fired sources that use refinery fuel gas. Fourth, nitrogen in tar sands crudes is present in higher molecular weight compounds than in other heavy crudes and thus requires more hydrogen and energy to remove. Fifth, some of this nitrogen will be converted to ammonia and other chemically bound nitrogen compounds, such as pyridines and pyrroles. These become part of the fuel gas and could increase NO_x from fired sources. They further may be routed to the flares, where they would increase NO_x.

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[60] See, for example, USGS, 2007, Table 1.

[61] James H. Gary, Glenn E. Handwerk, and Mark J. Kaiser, Petroleum Refining: Technology and Economics, 5th Ed., CRC Press, 2007, p. 200 and A.M. Aitani, Processes to Enhance Refinery-Hydrogen Production, Int. J. Hydrogen Energy, v. 21, no. 4, pp. 267-271, 1996.

[62] Murray R. Gray, Tutorial on Upgrading of Oil Sands Bitumen, University of Alberta, Available at: http://www.ualberta.ca/~gray/Links%20&%20Docs/Web%20Upgrading%20Tutorial.pdf.

[63] See, for example, James G. Speight, Synthetic Fuels Handbook: Properties, Process, and Performance, McGraw-Hill, 2008, Appendix A.

These types of chemical differences between the current crude slate and the new crude slate facilitated by the Rail Spur Project were not addressed at all in the DEIR. While both the Santa Maria and Rodeo Refineries may currently be operating within their permit limits, and may even continue to do so, the potential subject increases must be measured and evaluated relative to the CEQA baseline.

E. Increased Metal Content Not Evaluated

The baseline slate includes very little tar sands crudes, potentially from 2% to 7% of the crude slate. DEIR, p. 2-27. The Project could increase the import of heavy sour tar sands crude by up to the entire permitted capacity of the Refinery. These crudes have higher metal content than the baseline crude slate. [64] This represents a significant increase in a type of crude that will increase emissions compared to the current Refinery slate. The impacts from this change were not evaluated in the DEIR.

The U.S. Geological Survey ("USGS"), for example, reported that "natural bitumen," the source of all Canadian tar sands-derived oils, contains 102 times more copper, 21 times more vanadium, 11 times more sulfur, six times more nitrogen, 11 times more nickel, and 5 times more lead than conventional heavy crude oil, such as those currently refined from local sources.[65]

The environmental damage caused by these metal pollutants includes bioaccumulation of toxic chemicals up the food chain and a direct health hazard from air emissions. These metals, for example, mostly end up in the coke. Thus, higher levels of metals will be present in the coke. The DEIR indicates that "[m]etals that are present in coke have been detected in grouondwater at concentrations above the California Department of Health maximum contamination levels (MCL) in the area around the coke pile runoff area..." DEIR, p. 4.7-39/40. Thus, a switch to tar sands crude could contribute to this existing significant impact from the coke pile, which was not disclosed in the DEIR.

Further, larger amounts of coke may be produced by the tar sands crudes than the current crude slate. The metal content of fugitive dust from coke piles could increase to dangerous levels. The California Air Resources Board, for example, has classified lead

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[64] Straatiev and other, 2010, Table 1; Brian Hitchon and R.H. Filby, Geochemical Studies - 1 Trace Elements in Alberta Crude Oils, http://www.ags.gov.ab.ca/publications/OFR/PDF/OFR_1983_02.PDF; F.S. Jacobs and R.H. Filby, Trace Element Composition of Athabasca Tar Sands and Extracted Bitumens, Atomic and Nuclear Methods in Fossil Energy Research, 1982, pp 49-59; James G. Speight, The Desulfurization of Heavy Oils and Residua, Marcel Dekker, Inc., 1981, Tables 1-1, 2-2, 2-3, 2-4 and p. 13 and James G. Speight, Synthetic Fuels Handbook: Properties, Process, and Performance, McGraw-Hill, 2008, Tables A.2, A.3, and A.4; Pat Swafford, Evaluating Canadian Crudes in US Gulf Coast Refineries, Crude Oil Quality Association Meeting, February 11, 2010, Available at: http://www.coqa-inc.org/20100211_Swafford_Crude_Evaluations.pdf .

[65] R.F. Meyer, E.D. Attanasi, and P.A. Freeman, Heavy Oil and Natural Bitumen Resources in Geological Basins of the World, U.S. Geological Survey Open-File Report 2007-1084, 2007, p. 14, Table 1, Available at http://pubs.usgs.gov/of/2007/1084/OF2007-1084v1.pdf.

as a pollutant with no safe threshold level of exposure below which there are no adverse health effects. Thus, just the increase in lead from switching up to tar sands crude is a significant impact that was not disclosed in the DEIR. Accordingly, crude quality is critical for a thorough evaluation of the impacts of a crude switch, such as facilitated by rail import.

sec. 4.11 public services and utilities, does not address how a local train accident would be handled, given existing services and utilities. It couldn't be, which is a significant unmitigated impact.

VI. HAZARDS AND HAZARDOUS MATERIALS IMPACTS ARE SIGNIFICANT

Section 4.7 of the DEIR contains the "hazards and hazardous materials" impact analyses, sometimes call the risk of upset analysis. This section evaluates two separate impacts: (1) on-site accidents from crude oil unloading through pipeline transport to storage tanks at the Refinery and (2) rail transport accidents. The supporting material includes extensive discussion of the applicable regulatory framework and general methods used to analyze these types of impacts. However, the project-specific results and conclusions appear magically, with no support for or explanation of how the conclusions were reached. The available information indicates that the DEIR's analysis is fatally flawed and the risk of upset impacts are highly significant.

A. Crude Slate Not Disclosed

As explained elsewhere in these comments, the composition of the crude slate must be known to evaluate impacts. This is particularly critical for the analysis of accidents as the probability, severity, and consequences of an accident depend directly on the chemicals in the crude. They determine, for example, the flammability of the crude and its potential to corrode tank cars, pumps, pipelines, tanks, and other equipment hand store and transport the crude. The Federal Railroad Administration, for example, has observed "an increasing number of incidents involving damage to tank cars in crude oil service in the form of severe corrosion of the internal surface of the tank, manway covers, and valves and fittings," and suggested that this may involve contaminated oil.[5] Further, some types of crudes are more challenging to contain and cleanup in the event of an accidental release.

As the DEIR admits: "the thermal radiation hazards from hydrocarbon pool fires depends on a number of parameters, including the composition of the hydrocarbon mixture..." DEIR, p. 4.7-15. The Project involves a dramatic change in crude slate composition, especially its hydrocarbon composition. The crude slate will change from a relatively inflammable material with high molecular weight hydrocarbons to new crudes ranging from light, highly volatile crudes with low molecular weight hydrocarbons such as propane and butane (Bakken) to heavy, highly corrosive tar sands crudes blended with condensates that can cause different types of accidents. See Comments V and VI.B.

The DEIR asserts that "[r]adiative properties of the fire were based on a detailed analysis of typical crude oil that would be delivered by rail". DEIR, p. 4.7-16. However, the DEIR does not identify this crude further. Where is the detailed crude analysis that the fire analyses was based on? What specific crude was analyzed, i.e., was it Bakken or tar sands or something else? How representative is it of the range of crudes that would be imported by rail? Where are the assumed properties used to assess flammability and the resulting analysis itself? What is the basis of the burning rate of 0.228 mm/s assumed for "light crude oil"? DEIR, p. 4.7-16.

The hazards section of the DEIR does not acknowledge that a range of crudes will be imported by rail with widely varying properties, or indicate that crude composition was considered in any other aspects of the various hazard analyses except fire hazard. The DEIR, for example, notes that unloaded crude would be sent by pipeline to "be stored in the existing refinery storage tanks. Therefore, crude oil storage would not result in any increase in fire and explosion risk at the refinery". DEIR, p. 4.7-57. This is wrong because the projected change in crude slate composition will increase the probability of accidental releases from the tank farm and their consequences, as the stored crudes will be either more volatile, flammable, and/or corrosive. The DEIR has failed to analyze these impacts.

B. Risk of Upset Impacts Are Significant

The DEIR evaluated several crude release accident scenarios: (1) tank farm releases; (2) on-site crude railcar accident pool fires; (3) on-site crude railcar accident BLEVES; (4) crude pipeline accident pool fires; (5) off-site train accidents. DEIR, Appx. H. The DEIR suggests that none of these accident scenarios result in significant impacts. DEIR, Sec. 4.7.4.

However, the DEIR buries the supporting analyses in dense appendices that are not accessible to the typical DEIR reviewer. The DEIR fails to explain how to translate the results of these analyses into impact conclusions that can be understood by non-subject-matter experts, thus preventing meaningful public review of the impacts. The DEIR further incorrectly summarizes the results of these analyses in the text as insignificant, when, in fact, they are highly significant. Finally, the DEIR uses the wrong significance thresholds, fails to evaluate the impact of crude slate changes, and fails to evaluate impacts to on-site workers, the most at risk population.

1. <u>Worker Impacts Excluded</u>

The DEIR fails to evaluate the impacts to workers, arguing that "OSHA related worker issues are outside the scope of the EIR." DEIR, p. 4.3-52. The DEIR specifically excludes workers from its risk of upset significance criteria, arguing they do not apply to occupational safety, *viz.*, "Occupational risk, which is governed by state and federal OSHAs is considered to be more voluntary and is generally judged according to more lenient standards of significance than those used for involuntary exposure". DEIR, p. 4.7-55.

However, neither state nor federal OSHA nor other regulations cover the types of involuntary risks imposed by unit train accidents and exploding pipelines and tanks on workers in the vicinity of these facilities. A death is a death and it should not matter whether it is an on-site worker, off-site worker, or other member of the public. A worker is a member of society at large and is protected by CEQA. None of the federal and state laws reviewed in DEIR Section 4.7.2 include any measures to protect any workers, on-site or off-site, from train, pipeline, and tank farm accidents.

Regardless, CEQA is not a gap-filling regulatory program. CEQA covers all impacts to all media -- the public, air, water, land, biological resources -- regardless of how they may be classified, i.e., on-site workers, off-site workers, residents, threatened and endangered species, etc. These types of catastrophic events are entirely outside of the jurisdiction of OSHA or any other federal or state regulatory program and must be evaluated in the DEIR. The DEIR must be revised to address worker impacts and be recirculated.

2. <u>Tank Farm Accidents Are Significant</u>

The DEIR states that imported crude would be sent through a 3,525-foot long pipeline to existing refinery storage tanks, concluding: "Therefore, crude oil storage would not result in any increase in fire and explosion risk at the refinery." DEIR, p. 4.7-57. The DEIR does not contain any analysis to support this assertion. See, for example, Appendix H, which does not include a storage tank scenario, but rather only rail car and pipeline accident scenarios.

This unsupported assertion is incorrect because it assumes no change in properties of stored crude. The Project would change the composition of the crude slate. If highly flammable Bakken crudes were imported, for example, the risk of fire and explosion would significantly increase at the tank farm, impacting not only workers, but also offsite parties. The flammability classification of Bakken is rated at Level 4, the highest flammability classification, the same as for methane and propane gases.[66] On January 2, 2014, the Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a safety alert addressing the flammability characteristics of crude oil produced from the Bakken Shale formation.[67] Alternatively, if tar sands crudes were imported, corrosion issues could arise at the existing tanks, leading to accidental releases. Neither of these risk scenarios was identified or evaluated in the DEIR.

Rather, the DEIR only contains a description of the existing tank farm. DEIR, Sec. 4.7.1.5, stating: "Thermal radiation impacts from crude oil tank fires could cause injury 220 feet away." DEIR, p. 4.7-37. The DEIR goes on to explain that the closest receptor is further away. Thus, the DEIR asserts: "Given the properties of crude oil, the

[66] Cenovus MSDS sheet for Bakken Crude.
[67] PHMSA, Safety Alert, January 2, 2014: Preliminary Guidance from Operation Classification.

likelihood of an explosion is virtually non-existent and consequently explosion scenarios are not addressed further in this document." DEIR, p. 4.7-37.

However, the analyses supporting the claimed 220-foot injury distance is not included in the DEIR and apparently based on the crude slate currently processed at the Santa Maria Refinery. Further, the nature of the "injury" is not disclosed. Regardless, a switch from current crude to Bakken crude would significantly increase the injury distance, likely far in excess of the 425-foot distance to the nearest receptor. Thus, accidental releases from the tank farm were not analyzed in the DEIR and are likely highly significant.

3. <u>Pipeline Accidents Are Significant</u>

The DEIR contains a crude pipeline accident analysis for a pool fire, assuming a spill of 692,000 barrels of crude for wind speeds of 1 meter per second (m/s) (about 2 miles per hour (mi/hr)) and 20 m/s (about 45 mi/hr). DEIR, Appx. H, pp. H-14 to H-17. This analysis is dismissed with the misleading characterization that "[w]orst-case thermal radiation injury levels would extend approximately 800 meters from the pool fire that could result from a catastrophic pipeline failure on the refinery site. Based on this modeling, it was determined that there would not be any potential for offsite injuries associated with worst-case unloading facility crude oil spill and fire." DEIR, p. 4.7-57.

The supporting analyses are included in Appendix H, in a format that is not accessible to the average reviewer. Thus, they are extracted and summarized in Table 3.

Table 3
Crude Pipeline Accident Pool Fire
(DEIR, Appx. H)

Heat Flux (kW/m2) =	5	10	12.5
Wind Speed (m/s)	**Impact Distance (ft)**		
1	1647	889	764
20	2641	1555	1273

The impact metric in these analyses is "heat flux" expressed as kilowatts per square meters (kW/m^2). Heat flux is thermal radiation intensity, the measure used in the DEIR to determine the resulting injury to exposed parties. DEIR, Table 4.7.2. The DEIR states that it "assumed that all persons exposed to 10 kW/m^2 would suffer serious injuries. Serious injuries would start to be realized at and above 5 kW/m^2... Exposure to thermal radiation levels in excess of 10 kW/m^2 would likely begin to generate fatalities in less than 1 minute. All persons exposed to thermal radiation within the flame area were assumed to suffer fatalities regardless of exposure duration." DEIR, p. 4.7-19. See also DEIR Table 4.7-4. The three heat flux criteria reported in Table -- were selected by the DEIR preparers to evaluate the significance of accident scenarios.

Any population located between the accident site up to the reported impact distance, e.g., as far away as 2,641 feet in Table 3, would experience significant impacts. At a heat flux of 5 kW/m^2, 10% injury would be experienced in the exposed population up to 2,641 feet from the accident if the wind were blowing at 20 m/s during the accident. Up to 1,555 feet from the accident, 100% of the exposed population would be injured, including second-degree burns in 14 seconds and 10% fatality at 60 seconds. And up to 1,273 feet from the accident, significant fatalities would occur.

A pipeline accident could occur anywhere along the pipeline route, but would most likely occur at the tank farm, where the crude oil is transferred into tankage. Assuming a pipeline accident at the tank farm under calm wind conditions (1 m/s or about 2 mi/hr), significant impacts would occur up to 1,647 feet from the accident site. The impacted area includes an industrial area 425 feet northeast of the tank farm and a residence within the industrial area at 1,200 feet. DEIR, p. 4.7-37. At a wind speed of 20 m/s (about 45 mi/hr), all persons up to 2,641 feet away would be seriously impacted and within a radius of 1,273 feet from the accident site, they would all be killed.

Thus, clearly, a pipeline accident involving the new crude slate has the potential to result in significant off-site (as well as even more significant on-site worker) impacts that were incorrectly described in the DEIR. The actual modeling indicates that off-site parties would be killed. This is a significant impact.

4. <u>On-Site Train Accidents Are Significant</u>

The DEIR also included on-site crude rail car accidents resulting in both pool fires and Boiling Liquid Expanding Vapor Explosions or "BLEVEs" for wind speeds ranging from 1 m/s to 20 m/s. DEIR, Appx. H. The DEIR asserts, based on these analyses buried in Appendix H, that "potential hazards associated with the unloading facility are considered less than significant" and "[h]azards associated with the onsite portion of the Rail Spur Project would be *less than significant (Class III*")." DEIR, pp. 4.7-57/58 (emphasis in original). No significance thresholds are articulated to support these conclusions nor is any explanation provided to explain the basis for the DEIR's conclusion.

However, independent analyses based on the railcar accident modeling in Appendix H coupled with significance levels scattered about in the DEIR indicates that the risks from train accidents within the Refinery boundary result in significant on-site and off-site impacts for both pool fires and BLEVEs.

a. Pool Fires

The DEIR analyzes pool fires resulting from a crude railcar accident in which 54,476 barrels of crude (i.e., the entire contents of a unit train) are released for wind speeds ranging from 1 m/s to 20 m/s (2 mi/hr to 45 mi/hr). DEIR, pp. H-2 to H-9. These analyses report "heat flux" in kW/m^2 as a function of distance from the release, for distances of 100 to 1,000 meters (328 to 3,281 feet). An accident could occur anywhere within the Refinery boundary shown on Figure 2-1. The results of the DEIR's railcar pool fire analyses are buried in Appendix H in a format not accessible to the average reviewer. Thus, they are summarized in Table 4.

Table 4
Summary of Crude Railcar Accident Analysis of Pool Fires
(DEIR, Appx. H)

Heat Flux (kW/m2) =	5	10	12.5
Wind Speed (m/s)	**Impact Distance (ft)**		
1	775	407	331
5	876	495	410
10	928	541	446
20	1404	958	810

The interpretation of these data (and other similar data extracted from Appendix H and summarized in these comments) requires a map that shows the location of potentially exposed populations relative to the accident sites (anywhere along the rail line within the Refinery boundary). It is common to include such a map in an EIR to locate the sensitive receptors. However, the DEIR fails to include a sensitive receptor map and is thus deficient. The boundaries of the Refinery are shown in DEIR Fig. 2-1. This figure and Google Earth maps indicate that the northeastern boundary of the Refinery at roughly the elbow of Highway 1, where the Southern Pacific rail line enters the Refinery, abuts industrial and residential property to the east and north and recreational areas in the Coastal Zone to the west. Sensitive receptors are located in these areas, for example, residences along Monadella Street and in areas to the north and south of Highway 1 (Willow Road) and users of the Oceano Dunes State Vehicular Recreation Area and Oso Flaco Lake and Dunes to the west.

The results of the railcar accident modeling summarized in Table 4 indicate that both on-site and off-site impacts are significant. When the wind speed is 20 m/s (45 mi/hr), the heat flux is 5 kW/m^2 at up to 1,404 feet from the accident site and 12.5 kW/m^2 up to 810 feet from the accident site. A comparison of Figures 2-1 and 2-4 indicates that if the accident occurred near the junction of Willow Road and U.S. 1, off-site sensitive receptors would be located within 1,404 feet of the accident site. Thus, significant off-site impacts would occur from an accident within the Refinery boundary.

Further, refinery workers would be present throughout the Refinery and at the unloading facility. These workers would be the most highly exposed populations and would experience significant mortality.

Thus, railcar accidents within the Refinery boundary would result in significant impacts to both on-site and off-site populations. These were not disclosed in the DEIR, but rather buried in a maze of tables that are not explained or analyzed.

b. BLEVES

The DEIR also evaluated the radiant heat exposure and explosion over pressures resulting from a railcar accident involving a Boiling Liquid Expanding Vapor Explosion or "BLEVEs." However, the DEIR fails to discuss the results of this analysis, which is buried in DEIR Appendix H in a format not accessible to the average reviewer. Thus, they are summarized in Table 5.

Heat flux for the BLEVE analysis is reported in the DEIR in units of kilojoules per square meter (kJ/m^2), which is just another measure of heat density, similar to kW/m^2 used to evaluate pool fires, but just expressed in different units. The DEIR explains that at a heat density (or radiation dosage) of 40 kJ/m^2, 10% injury will result, at 150 kJ/m^2, 100% injury will result, and at 250 kJ/m^2, 1% fatalities will occur. DEIR, Table 4.7.4.

Table 5
Results of Radiation Exposure Analysis
from Railcar Accident BLEVE
(DEIR, p. H-13)

Impact Distance (ft)	Radiant Heat Significance Threshold (kJ/m2)
1,690	40
1,194	80
1,066	100
859	150
830	160
643	250

Table 5 shows that significant impacts, 20% injury, will occur at up to 1,690 feet from the accident site. As discussed above, if the accident occurs near the vicinity of the intersection of Highway 1 and Willow Road, within the Refinery boundary, significant impacts will result outside of the Refinery, in industrial/residential areas to the east and in the Coastal Zone areas to the west. Further, workers within 1,690 feet of the accident would also experience significant impacts, and those within 643 feet of the accident may die. These are significant impacts that were not disclosed in the DEIR.

5. <u>Offsite Impacts From Train Accidents Are Significant</u>

The DEIR also evaluated train accident impacts outside of the Refinery, within San Luis Obispo County (SLOC). The DEIR asserts this analysis was prepared following guidelines of the American Institute of Chemical Engineers, Center for Chemical Process Safety (CCPS, 1995) and the parameters discussed in DEIR Section 4.7.1.3. DEIR, p. 4.7-61. However, this analysis does not follow the CCPS method; it uses the wrong significance thresholds; it fails to discuss or analyze in any fashion the factors that actually affect rail accidents; it is totally unsupported; it fails to analyze the most significant impacts, which occur outside of San Luis Obispo County; it is based on outdated information; and it ignores most impacts caused by rail accidents, including the impacts of spilled crude oils to water, land, and biological resources and public health impacts from exposure to toxic fumes and smoke. Each of these issues is discussed below.

a. Significance Threshold

The San Luis Obispo County Initial Study Checklist defines significant risk if the project will "result in a risk of explosion or release of hazardous substances," or "create any other health hazard or potential impact." Rather than use this definition of significant risk, the DEIR sets it aside and adopts a probability-based risk profile curve approach from Santa Barbara County to evaluate risks associated with crude oil unit train transportation. DEIR, p. 4.7-55, Table 4.7.12, Fig. 4.7-5.

This method minimizes the significance of many potential injuries and deaths by assigning probabilities that a certain number of injuries or deaths will occur, based on statistics that do not capture the proposed increase in rail traffic. Under the San Luis Obispo definition, the mere "risk" of an explosion, a release of crude oil, any health hazard or any potential impact is significant. Thus, as there is ample evidence that spectacular accidents involving crude-carrying unit trains with well documented property damage and death have recently occurred, train accidents are per se significant.

The complex (and unsupported) probability-based risk profile method used in the DEIR seeks to downplay the very well documented significant consequences of accidents involving unit train accidents carrying crude oils. These accidents will happen, they will result in significant impacts, and the DEIR should focus on minimizing their occurrence, rather than burying the fact that they do occur in a maze of unsupported and incoherent probability analysis. Further, the DEIR's analysis is based on very out of data information that does not consider recent history.

b. The DEIR Fails To Acknowledge Recent History

The DEIR's analysis is based on outdated accident statistics, from CCSP (1995), published long before the recent surge in the transport of crude oil by rail. Recent history indicates that the accidents involving unit trains carrying crude oil have sky-rocketed. They also demonstrate the unique set of challenges posed by highly flammable materials, such as Bakken crudes, transported in unsafe tanker cars configured in unit trains that are "virtual pipelines" of highly flammable material, which now dominate the industry. Risks are compounded when highly flammable material, such as Bakken crudes, are shipped in large amounts.[68]

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[68] National Transportation Safety Board, Safety Recommendation R-14-4 to -6, January 21, 2014, Available at: http://www.ntsb.gov/doclib/recletters/2014/R-14-004-006.pdf.

Historically, most crude oil has been transported in pipelines. However, in places like North Dakota and Canada that have seen huge recent increases in crude oil production, the existing crude oil pipeline network lacks capacity to handle the higher volumes being produced. Pipelines also lack the operational flexibility and geographic reach to serve many potential markets, especially the west coast. Railroads, though, have capacity, flexibility, and reach to fill the gap.

Small amounts of crude oil have long been transported by rail, but since 2009 the increase in rail crude oil movements has been enormous. In the United States, crude oil shipments have increased from 10,800 car loads in 2009 to about 400,000 in 2013. In Canada, shipments of crude oil by rail increased from a mere 500 car loads in 2009 to 160,000 car loads in 2013.[69] Continued large increases are expected in 2014. Crude oil accounted for 0.8 percent of total Class I carload originations for all of 2012, 1.1 percent in the fourth quarter of 2012, and 1.4 percent in the first quarter of 2013. It was just 0.03 percent in 2008.[70]

This recent rise in crude transportation by rail has resulted in soaring numbers of crude oil releases to the environment in the form of both accidents and "non-accident" releases such as leaks. The Pipeline and Hazardous Materials Safety Administration (PHMSA) incident records underscore these growing risks. The number of incidents involving crude oil transportation by rail are as follows:

- 2009: 0
- 2010: 9
- 2011: 34
- 2012: 86
- 2013: 85 (partial)[71]

Similar statistics were published by the Wall Street Journal, based on data generated by the Association of American Railroads ("AAR"):[72]

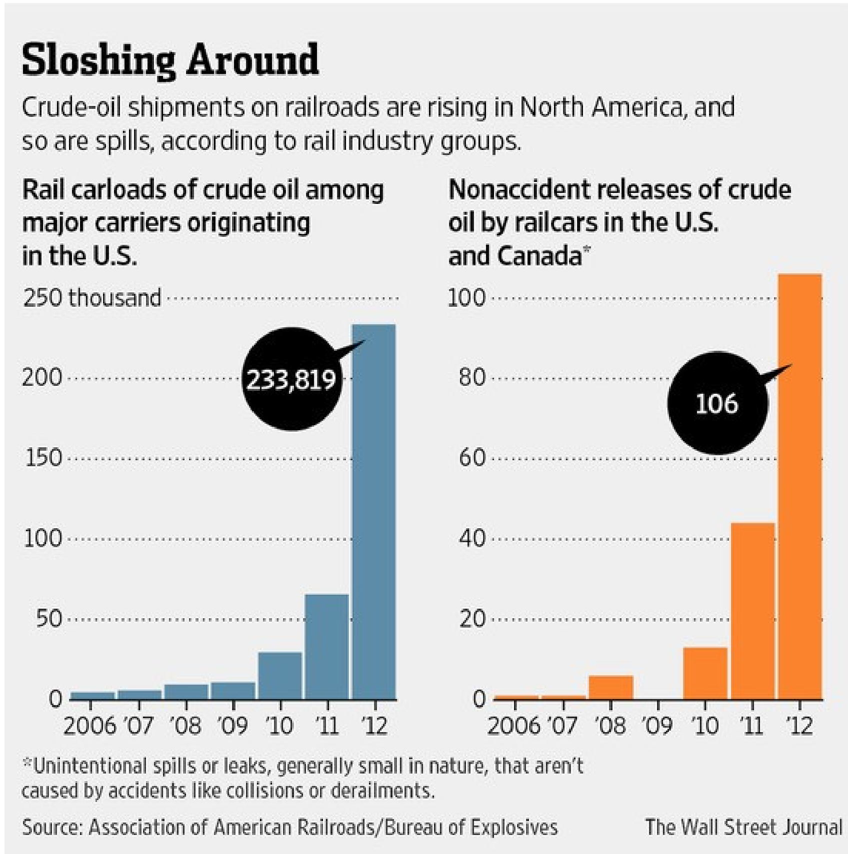
[69] TSBC, Rail Safety Recommendations, January 23, 2014, Available at: http://www.tsb.gc.ca/eng/recommandations-recommendations/rail/2014/rec-r1401-r1403.pdf.

[70] American Association of Railroads, "Moving Crude Petroleum by Rail," https://www.aar.org/keyissues/Documents/Background-Papers/Crude-oil-by-rail.pdf; May 2013, at 3-5.

[71] Data derived from PHMSA incident reports - http://www.phmsa.dot.gov/hazmat/library/data-stats/incidents.

[72] The Wall Street Journal, "Officials Tighten Crude-Shipping Standards," http://online.wsj.com/news/articles/SB10001424127887323838204578654463632065372; August. 7, 2013. (Also included as Attachment 3.)

Figure 6
Industry shipment and incident reports



An article in the January 21, 2014 Contra Costa Times, which serves one of the areas through which the Project's unit trains would pass, similarly explains that more crude oil was spilled in U.S. rail accidents in 2013 than in the nearly four decades since the federal government began collecting data on such spills. More than 1.15 million gallons of crude oil was spilled from rail cars in 2013 alone. By comparison, U.S. railroads spilled a combined 800,000 gallons of crude oil between 1975 and 2012.[73] These data do not include Canada, where more than 1.5 million gallons of crude oil were spilled in the Lac- Mégantic, Quebec accident on July 6, 2013, when a runaway train derailed, exploded, and killed 47 people. The cargo was Bakken crude from North Dakota.

The subject unit trains are "virtual pipelines" that pass through heavily populated residential areas. When such large volumes of flammable crude oil are on a single train involved in an accident, as seen in the Lac-Mégantic accident described below, they explode in spectacular fireballs. The resulting accidents can cause major loss of life, property damage, and environmental consequences. The sharp increase in crude oil rail

[73] Curtis Tate, Data: Oil Spills from Rail Cars Massive, Contra Costa Times, January 21, 2014.

shipments has significantly increased safety risks to the public.[74] Crude oil is problematic when released because it is flammable, especially Bakken crude. The risk is compounded because it is commonly shipped in large amounts. These increased risks have not been evaluated in the DEIR.

Unfortunately, the surge of incidents and releases has not been matched by an increase in the resources available to responders and regulators, pointing to the need for mitigation. The DEIR fails to address the lack of adequate resources anywhere along the rail route, even in SLOC, to address the type of catastrophic accident that is likely to occur. Example of some recent accidents follow.

1. *Lac-Mégantic*

On July 5, 2013, a train hauling 72 DOT-111 tanker cars loaded with 2.0 million gallons of crude from the Bakken shale oil field in North Dakota, one of the crudes proposed to be imported by the Rail Spur Project, slammed into Lac-Mégantic, a town of 6,000 located in Quebec. Owned by an American company – Montreal, Maine and Atlantic Railway – the train had only a single staffer, who abandoned the train in order to sleep in a motel before a replacement crew arrived to complete the train's journey to an oil refinery on Canada's east coast. The brakes on the five-locomotive train malfunctioned, and it began a seven-mile roll toward the small town. Reaching a speed in excess of 60 mi/hr, the train reached a bend in the tracks, derailing and dumping 1.5 million gallons of Bakken crude, which caught fire and incinerated dozens of buildings. Forty-seven people were killed. About 1.6 million gallons of Bakken crude oil were released, covering an area of 77 acres. Oil spilled into the Chaudière River and was transported as far as 74 miles away.[75] While this accident occurred in Canada, the freight railroad operating environment in Canada is similar to that in the United States.

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[74] Association of American Railroads, Bureau of Explosives, Annual Report of Hazardous Materials Transported by Rail, BOE 12-1, 2013.

[75] NTSB, Safety Recommendation In reply refer to: R-14-4 through -6; January 21, 2014. Available at: http://www.ntsb.gov/doclib/recletters/2014/R-14-004-006.pdf.

Figure 7
Post-Accident Aerial Photo of Lac-Megantic (Reuters)

The DOT-111 tanker cars involved in this accident are the same ones that the DEIR suggests will be used to import this very same crude, but notes that "nearly 25 percent of the DOT-111 fleet carrying crude today meets the higher design standards..." DEIR, p. 4.7-15. Will the DEIR's tank car fleet be within the 25% safe or the 75% unsafe DOT-111 fleet?

The DEIR pretends to analyze a similar accident within SLOC, but amazingly, fails to find any significant impacts by using probabilistic methods. However, regardless of the estimated probability, when an accident occurs, the resulting impacts are highly significant. Further information regarding the Lac-Mégantic accident is provided in Attachment 2, "Analysis of the Potential Costs of Accidents/Spills Related to Crude by Rail."[76] This analysis demonstrates that the costs of crude-by-rail accidents/spills can be very large, and that a major unit train accident/spill could cost $1 billion or more for a single event. Such accidents are per se significant and must be addressed and mitigated in the DEIR.

As explained in Attachment 2, the Lac-Mégantic rail accident/spill will likely have costs on the order of $500 million to $1 billion excluding any civil or criminal damages. Costs/damages for a similar incident could have been substantially higher had it occurred in a more populated area, such as the San Francisco Bay Area or Los Angeles, areas through which the Project's similarly configured and loaded unit trains will pass. Lac-Mégantic is also relevant in that it shows how an accident involving highly flammable light crude (such as the Bakken crude) can have devastating

[76] This analysis was prepared by The Goodman Group, Ltd, a consulting firm specializing in energy and regulatory economics, on behalf of Oil Change International.

consequences even in a small town in terms of loss of human life and widespread explosion and fire damage to surrounding property. The DEIR failed to recognize this demonstrated significant impact, instead dismissing it with unsupported probability analyses.

2. *Marshall, Michigan*

Attachment 2 also analyzes the spill of tar sands DilBit from Enbridge's Line 6B in Marshall, Michigan: This rupture in 2010 had costs of about $1 billion for Enbridge. The spill volumes at Marshall (840,000 gallons) were within the range of the amount of spill possible for ~~this Project (and, in fact, subst~~antially less than the maximum spill) if a crude by rail unit train released much of its cargo. Costs/damages for similar incidents within California could be substantially higher if it occurred in a more populated area, such as the Bay Area or Los Angeles. Marshall is also relevant in showing the high potential cost of dilbit spills into water (and rail lines are often very close to water, e.g., along the Sacramento River and within the Sacramento-San Joaquin Delta, the water supply for most of California's agriculture and drinking water).

3. *Alabama*

On November 8, 2013, a 90-car unit train carrying 2.7 million gallons of Bakken crude oil in DOT-11 tank cars derailed and exploded in a rural wetland in western Alabama, spilling crude oil into the surrounding wetlands and igniting a fire that burned for several days.[77] No injuries resulted from the accident, but a similar accident in a more populated location would certainly have caused serious risk to public safety.

[77] Karlamangla, Soumya, "Train in Alabama oil spill was carrying 2.7 million gallons of crude." Los Angeles Times, http://articles.latimes.com/2013/nov/09/nation/la-na-nn-train-crash-alabama-oil-20131109, November 9, 2013.

Figure 8
Aerial photo of Alabama derailment and explosion (Reuters)

4. Casselton, North Dakota

On December 30, 2013, a similar explosion occurred in Casselton, North Dakota, causing a fiery accident resulting in the town being evacuated. The BNSF train was more than 100 cars, all DOT-111, and about a mile long, of which at least 10 cars were destroyed.[78] Several of the DOT-111 tank cars ruptured and released crude oil that ignited. The post-accident fire destroyed two locomotives and thermally damaged several additional tank cars causing violent, fiery eruptions. Dense, toxic smoke forced a temporary evacuation of the town. Apparently, another train carrying grain derailed first, causing the adjacent Bakken oil filled cars to derail,[79] thus highlighting the hazards associated with multiple trains using the same or adjacent tracks, as proposed by the Rail Spur Project. The coastal line, for example, carries passenger traffic along the Pacific coast. Thus, human life could be put at risk, rather than just a train carrying grain.

5. New Brunswick, Canada

On January 7, 2014, 17 cars in a 122-unit train derailed and exploded near Plaster Rock, New Brunswick. No one was injured, but about 150 people were evacuated. The petroleum products originated in Western Canada and were destined for the Irving Oil Refinery in St. John.[80]

78 DOT-111 Tank Car, Wikipedia.
79 NTSB, Staff Recommendation R-14-01 - 03, January 23, 2014.
80 DOT-111 Tank Car, Wikipedia.

c. The DEIR Fails To Evaluate Crude By Rail As A Security Risk

The explosions in Lac-Mégantic and Alabama were accidents, but they could easily have been created by terrorists. The fact that terrorists haven't yet targeted rail tank cars carrying crude oil doesn't mean it won't occur in the future. The recent Canadian accidents demonstrate the amount of death and destruction that can happen if a rail tank car overturns. Terrorists will have read about these accidents. Without any additional security precautions, crude oil tank cars will be seen as a soft target for an attack, particularly, since they are often manned by small crews and often left unattended.

d. Off-Site Train Accident Analysis Unsupported

The results of the off-site train accident analysis appears full blown in Table 4.7-12 for a 72.6 mile segment of rail line from Highway 101 to Nipomo, broken into small segments. This table is apparently the basis of Figure 4.7-5, which presents the frequency of injuries and fatalities as a function of the number of each. Both of these summary results are presented with no supporting analysis, equations, citations, or explanatory material. Table 4.7-12 is also presented in Appendix H at H-19 and H-20, again with no supporting analysis, equation, citations, or explanatory material.

The DEIR asserts this analysis was prepared following guidelines of the American Institute of Chemical Engineers, Center for Chemical Process Safety (CCPS, 1995) and the parameters discussed in DEIR Section 4.7.1.3. DEIR, p. 4.7-61. However, I am very familiar with these guidelines and have used them in many similar analyses. I cannot follow or verify the risk analyses in DEIR Sec. 4.7. The following bulleted items list the columns in Table 4.7.12 and their support or lack thereof based on my review of the DEIR:

- Accident Probability (year): **no support**
- Probability Density: Table 4.7.6 ("default population densities")
- # of Trains per year: DEIR, pp. ES-3, 1-4
- Ignition: All Spill Probability (per year): **no support**
- Ignition: Small Spill Probability (per year): **no support**
- Ignition: Large Spill Probability (per year): **no support**
- No Ignition: All Spill Probability (per year): **no support**
- No Ignition: Small Spill Probability (per year): **no support**
- No Ignition: Large Spill Probability (per year): **no support**

The calculations and inputs to arrive at Table 4.7.12 are many and complex and MUST be included in an appendix to the DEIR, to the same level of detail as Appendix B for air emission calculations. The methods and inputs include, for example, the following types of standard calculations and inputs, none of which are disclosed in the DEIR:

> To evaluate whether a train accident is significant, one must estimate two numbers: 1) the probability that a consequence (e.g., injury or fatality) will occur from the accident and 2) the number of individuals that will be affected.
>
> These two numbers are usually calculated using standard procedures described in the Guidelines for Chemical Transportation Risk Analysis (CCPS, 1995). The first number, the probability that an incident outcome (i.e., a fatality or injury) will occur is given by:
>
> $$F_{g,i,k} = T \cdot A \cdot R_i \cdot L_g \cdot P_{i,k} \qquad (1)$$
>
> where:
>
> $F_{g,i,k}$ = frequency of incident outcome k for release size i on segment g
> T = trips per year
> A = accident rate per mile
> R_i = release probability for release size i
> L_g = length of segment g in miles
> $P_{i,k}$ = probability of incident outcome k for release size i
> g = segment counter
> i = release size counter
> k = incident outcome counter
>
> The second number, the associated consequences or number of persons exposed, is given by:
>
> $$N_{g,i,k} = CA_{i,k} \cdot PD_g \cdot PF_{i,k} \qquad (2)$$
>
> where:
>
> $N_{g,i,k}$ = number of fatalities (or injuries) for incident outcome k for release size i on segment g
> $CA_{I,k}$ = consequence area associated with incident outcome k for release size i
> PD_g = population density for segment g
> $PF_{I,k}$ = probability of injury/fatality for incident outcome k for release size i
> g = segment counter
> i = release size counter
> k = incident outcome counter

Without the type of information used in the above equations, the DEIR's train accident analysis is wholly unsupported. The DEIR must be revised to reveal and support all of the input assumptions represented by the variables used in these equations. The revised DEIR must be recirculated.

The unsupported information in Table 4.7.12 was then used to create injury and fatality risk charts that plot the frequency of accidents per year versus the number of injuries and fatalities in Figure 4.7-5. These are compared with Santa Barbara risk thresholds. There is no explanation for how the unsupported probability data from Table 4.7.6 was used to generate these risk curves. A complex series of calculations and various assumptions are typically involved, but none of these were disclosed in the DEIR, preventing public review. The DEIR must be expanded to support this analysis and recirculated to give the public an opportunity for input.

e. Entire Route In California Not Analyzed

The train accident analysis fails to analyze the risk of accident along the entire route within California, but rather stops at the northern San Luis Obispo County border and assumes no trains arrive or depart from the south. The DEIR indicates that unit trains will travel 68 miles[81] one-way within San Luis Obispo County and an additional 390 miles one-way outside of the County. DEIR, p. 4.3-42. Thus, the DEIR only analyzed the risk of train accidents for 17% of the route. This significantly understates the risk and consequences of train accidents as the County is sparsely populated. The projected rail route passes through some of the most densely populated areas with some of the most valuable real estate in the United States.

The DEIR fails to include a map that shows the route(s) that Project trains would follow. However, it does disclose that Union Pacific would be the carrier and includes a map of Union Pacific rail lines in California. DEIR, Fig. 4.12-2. This map indicates that trains may pass through some of the most densely populated areas in the United States, exposing some of the most sensitive and vulnerable public resources to significant adverse impacts.

The DEIR suggests that unit trains would most likely enter the northern part of the state, follow the rail line along the Sacramento River to Roseville, through Sacramento, Oakland, Santa Clara, San Jose, and down the coastal line to the Refinery. DEIR, p. 4.12-7 & Fig. 4.12-2. However, elsewhere, the DEIR indicates that trains could arrive from the north or the south (DEIR, p. 2-21), thus also passing through the densely populated Los Angeles area.

Unit trains approaching from the north would parallel the water supply for most of California, the Sacramento River and the Sacramento-San Joaquin Delta, and pass through some of the most densely populated areas and most valuable real estate in the world in the San Francisco Bay Area and Silicon Valley. An accident on the Mulford line between Santa Clara and Oakland or in San Jose, for example, which the DEIR indicates would be used (DEIR, p. 4.12-7), could have catastrophic effects on infrastructure, workers, and residents. As discussed elsewhere, the DEIR should have considered an alternate route, down the eastern side of the Central Valley, with a new connecting rail spur from Bakersfield to the Refinery, to avoid these significant impacts.

The federal preemption arguments in the DEIR do not prevent the County from requiring mitigation for significant impacts that occur on private land. Further, there is no preemption of the County's authority to refuse to issue a land use permit if Phillips 66 does not mitigate significant impacts that occur anywhere within California.

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[81] Elsewhere, the DEIR reports 72.6 miles within SLOC. DEIR, Table 4.7-12.

f. Track and Rail Car Condition Not Addressed

Unit trains loaded with up to 2.2 million gallons of crude oil (DEIR, p. 2-21) will travel one way over about 460 miles of rail line within California nearly every day. DEIR, p. 4.3-42. These trains can weigh up to 15,000 tons and extend for well over a mile. Rail accidents are the result of either an error on the part of the railroad operating personnel or a technical failure in the track, tank car design, and train control equipment. DEIR, p. 4.7-25, CCSP 1995, p. 64. The latter two can be anticipated and mitigated. The primary contributing factors to rail accidents that could have and should have been evaluated in the DEIR are track conditions, train speed, and railcar design.

Derailment rates are high on low class track and reduce rapidly as track quality improves. Broken rail is the factor most likely to pose the greatest risk to train operations as accidents due to broken rails are more frequent and more severe than average. They have been the cause of major derailments involving dangerous goods in both the U.S. and Canada.[82]

The DEIR made no attempt to assess track quality for the mainline route within California that would be used by unit trains. Rather, it dismisses the issue by stating that: "[m]ainline track is generally Class 5 or 6..." DEIR, p. 4.7-25. "Generally"? Is this true, especially along sections currently with light unit train traffic, such as coastal line? The DEIR is silent on track condition, which is a serious oversight. A survey could have and should have been conducted as an input to the risk of upset analysis and to evaluate alternate routes to mitigate impacts.

The severity and consequences of a derailment are related to speed because the energy dissipated during a derailment depends on the kinetic energy of the train, thus its speed and mass. Federal Railroad Administration data for mainline freight trains shows the number of cars derailed, an indicator of accident severity, is highly correlated with speed. Thus, speed reduction has the potential to reduce the severity and consequences of derailments.[83] The DEIR did not consider speed reduction.

Another key factor that affects both the probability and consequences of train accidents is the design and condition of the tank cars. CCSP 1995. The DEIR suggests that DOT-111 rail cars would be used. However, while the DEIR recognizes safety issues with these cars (see, e.g., p. 4.7-17, and 4.7-25) and explicitly recognizes that only about 25% of the current fleet has been upgraded to NTSB standards, it does not consider these flaws in its analyses and does nothing to assure that the Project will use the safest cars available that meet the most current safety standards. DEIR, p. 4.7-25. The DEIR

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[82] Transportation Safety Board of Canada, Rail Recommendations R14-01, R14-02, R14-03, January 23, 2014, Available at: http://www.tsb.gc.ca/eng/recommandations-recommendations/rail/2014/rec-r1401-r1403.asp#appx-a.

[83] C.P.L. Barkan, C.T. Dick and R. Anderson, Analysis of Railroad Derailment Factors Affecting Hazardous Materials Transportation Risk, Transportation Research Board Annual Meeting, 2003.

does not require any specific railcars nor safety standards for the rail cars that would be used in Project unit trains.

This is a serious flaw as it is widely acknowledged that the existing fleet of DOT-111 tank cars is unsafe for transporting crude oil or other hazardous materials. There are about 228,000 Class 111 tank cars currently in service in North America. Among many other deficiencies, the head and shells of DOT-111s are paper thin, and they lack many other vital safety features, such as head shields and protection for top fittings. As explained by the Transportation Safety Board of Canada (TSBC): "Many Class 111 tank cars do not have top fitting protection, head shields or thermal protection, and are not jacketed. The sides and heads of these tank cars are typically constructed with 7/16-inch-thick steel plate, which is thinner than some other classes of tank cars. When involved in accidents, these Class 111 tank cars are vulnerable to head and shell damage due to impacts, as well as fitting damage, which can result in the release of product. Furthermore, without thermal protection, additional product can be released through excessive venting of the safety relief device(s), or worse, through a thermal tear, which can result in complete product loss."[84]

Figure 9
Class 111 Tank Cars
Assumed in DEIR to Transport Crude (TSBC)

Rail tank cars should be able to withstand "rollover" accidents. But when pre-2011 DOT-111s are involved in accidents, even at low speeds, almost all of the tank cars rupture and release their contents. This was documented by the National Transportation Safety Board ("NTSB") in its "Cherry Valley accident report," cited in the Advanced Notice of Proposed Rulemaking for Hazardous Materials: Rail Petitions and Recommendations to Improve the Safety of Railroad Tank Car Transportation.[85] In that

[84] Transportation Safety Board of Canada, Rail Recommendation R14-01, R14-02, R14-03, January 23, 2014, Available at: http://www.tsb.gc.ca/eng/recommandations-recommendations/rail/2014/rec-r1401-r1403.asp.

[85] PHMSA-2012-0082 (HM-251), 78 FR 54,849 (Sept. 6, 2013).

low-speed accident (36 mph), 13 of 15 tank cars ruptured. The NTSB noted that similar disastrous failure rates had been observed in other accidents (New Brighton, PA – 12 of 23 cars were breached; Arcadia, OH – 28 of 32 were breached).

The Cenovus Material Safety Data Sheet (MSDS) for Bakken crudes rates its flammability at Level 4, which is the highest rating, the same as for methane and propane gases. Under Canadian regulations, propane must be carried in DOT-112 or DOT-114 tank cars, but not in the U.S. Thus, while the use of DOT-111 tank cars would be illegal in Canada, they could be used in the U.S. where Bakken crudes originates[86] and appear to be approved by the DEIR for use on this Project. After the Lac- Mégantic accident in Canada, the Canadian government proposed to reclassify crude oil as a highly hazardous material, upgrading its classification from flammable and non-explosive.[87] The DEIR is seriously deficient for failing to call out this significant risk, the use of unsafe railcars to import highly flammable Bakken crudes through densely populated areas to the Refinery in "virtual pipelines". This is reckless.

C. Mitigation Is Inadequate

The DEIR does not impose any mitigation for accidents involving the import and storage of a new crude slate as it alleges there are no significant impacts. (Crossbucks will be installed at all railroad spur crossing with the Refinery. DEIR, p. IST-37.) However, as I demonstrate above, this conclusion is wrong. The import of a new slate of crudes by rail will result in many significant impacts. These must be mitigated. The following sections discuss some of the mitigation measures that I recommend.

Notably, on January 23, 2014, the National Transportation Safety Board (NTSB)[88] issued a series of recommendations to the Department of Transportation to address the safety risk of transporting crude oil by rail.[89] In an unprecedented move, the NTSB issued these recommendation in coordination with the Transportation Safety Board of Canada. [90] These recommendations include tougher standards for all Classs-111

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[86] DOT-111 Tank Car, Wikipedia.

[87] Canada Orders Reinforced Fuel Trains After Disaster, January 10, 2014, Available at: http://crooksandliars.com/2014/01/canada-orders-reinforced-fuel-trains-after.

[88] NTSB Calls for Tougher Standards on Trains Carrying Crude Oil, January 23, 2014, Available at: http://www.ntsb.gov/news/2014/140123.html; FuelFix, Wreck Investigators Urge Tighter Rules for Oil Trains, January 23, 2014, Available at: http://fuelfix.com/blog/2014/01/23/rail-wreck-investigators-urge-tighter-rules-for-oil-trains/; The Globe and Mail, Canadian and U.S. Safety Watchdogs Warn of Oil-by-Rail's Risks in Push for Tighter Rules, January 23, 2014, Available at: http://www.theglobeandmail.com/news/politics/new-federal-rail-safety-proposal-to-tighten-scrutiny-of-crude-shipments/article16461771/#dashboard/follows/.

[89] NTSF, Safety Recommendation Letter R-14-001-003, January 23, 2014, Available at: http://www.ntsb.gov/doclib/recletters/2014/R-14-001-003.pdf and NTSB Safety Recommendation Letter R-14-004-006, January 21, 2014, Available at: http://www.ntsb.gov/doclib/recletters/2014/R-14-004-006.pdf.

[90] TSB and NTSB Call on Canadian and U.S. Regulators to Improve the Safe Transportation of Crude by Rail, Available at: http://www.tsb.gc.ca/eng/medias-media/communiques/rail/2014/r13d0054-

tank cars, not just new ones; strategic route planning; and emergency response assistance plans along routes where large volume of liquid hydrocarbons are shipped. All of these recommendations should be included as mitigation for the Rail Spur Project.

1. Community Emergency Preparedness Response

When a crude oil spill occurs, local response assets are generally the first ones on scene. These assets will include those provided by police departments, fire fighters, and emergency managers. Many times however, these response individuals are unaware of the nature of, and the threat posed by the materials that are being transported through their communities.

The public services and utilities section of the DEIR (Sec. 4.11), does not address how a local train accident would be handled. The DEIR concedes elsewhere that "In the unlikely event of an oil spill along the UPRR mainline tracks, there would likely be no oil spill containment or cleanup equipment available, and it would likely take some time for emergency response teams to mobilize adequate spill response equipment. Depending upon the location of the spill this could allow enough time for the spill to impact sensitive habitat and plants and animal species." DEIR, p. ES-7. Elsewhere the DEIR admits that "[o]peration of the Rail Spur Project could increase demand for fire protection and emergency response services." DEIR, pp. ES-9.

The only mitigation proposed for these deficiencies is implementation of a "Fire Protection Plan, Emergency Response Plan, Spill Prevention Control and Countermeasure Plan, training requirement for CALFIRE and the SMR fire brigade" within the Refinery. DEIR, pp. ES-9, IST-33. This is not adequate to address accidents along the 458 miles of track within California as it effectively places the burden of remediating the environmental consequences of an accident on local communities along the route. The DEIR failed to evaluate any alternatives to this do-nothing approach. The applicant could require its carrier to develop a comprehensive plan to ensure the availability of necessary response resources, including identifying and contracting the personnel and equipment necessary to respond to accidents along the route.

Congress, recognizing a gap in communication, mandated in the "9/11 Act"[91] that rail companies transporting security sensitive materials, including toxic-by-inhalation materials, but not including crude oil, improve communication with local officials. Rail carriers are now required to identify a point of contact and to provide information to (1) state and/or regional "Fusion Centers" that have been established to coordinate with state, local and tribal officials on security issues and which are located within the area encompassed by the rail carrier's rail system; and (2) state, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions

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20140123.asp; See also: Rail Recommendations R14-01, R14-02, R14-03 at http://www.tsb.gc.ca/eng/recommandations-recommendations/rail/2014/rec-r1401-r1403.asp and Backgrounder at http://www.tsb.gc.ca/eng/medias-media/fiches-facts/r13d0054/r13d0054-20140123.asp.

[91] Implementing Recommendations of the 9/11 Commission Act of 2007, Pub. L. 110-53; 121 Stat. 266.

and who directly contact the railroad to discuss routing decisions.[92] This knowledge enables local communities to have a better understanding of what is being transported near their homes and schools.

According to the mandate of the 9/11 Act, rail carriers transporting security sensitive materials are required to select lower-risk routes, based on an analysis of the safety and security risks presented various routes, railroad storage facilities and proximity of high-consequence targets along the route. The results of this analysis could dictate the rerouting of the security sensitive materials to other locations

Crude oil is not currently defined as "security sensitive" so the additional reporting requirement does not apply to rail carriers transporting crude oil, despite its obvious hazards. However, the DEIR should find the subject crudes as "security sensitive" and implement 9/11 Act requirements.

The lack of regulatory guidance on communication about the movement of crude oil via rail with local officials, neighbors and local businesses is inconsistent with the Administration's initiatives goal to improve preparedness. President Obama issued a proclamation on August 30, 2013 stating that September 2013 was National Preparedness Month. In this document, the President also stated that Americans should "refocus our efforts on readying ourselves, our families, our neighborhoods, and our Nation for any crisis we may face." Additionally he directed the Federal Emergency Management Agency to "launch a comprehensive campaign to build and sustain national preparedness with private sector, non-profit, and community leaders and all levels of government."[93] Private sector and community preparedness can't occur if the federal government fails to require the disclosure of information that could help communities become more prepared.

The failure to share information also contradicts the mission of the Citizen Corps, a FEMA-managed initiative. Its mission "is to harness the power of every individual through education, training, and volunteer service to make communities safer, stronger, and better prepared to respond to the threats of terrorism, crime, public health issues, and disasters of all kinds." http://www.ready.gov/citizen-corps. Disasters of all kinds include spills created by overturned rail tank cars carrying crude oil.

FEMA released a report on the Citizen Corps in September 2012. In this document entitled "Citizen Corps Councils Registration and Profile Data FY2011 National Report," FEMA Administrator Fugate stated that the Citizen Corps Councils provide '"the table"' for collaboration to "(i)ntegrate whole community representatives with emergency managers to ensure disaster preparedness and response planning represents the whole community and integrates nontraditional resources."[94] Again,

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[92] http://www.gpo.gov/fdsys/pkg/FR-2008-11-26/html/E8-27826.htm.

[93] http://community.fema.gov/gf2.ti/f/280514/8233733.1/PDF/-/Presidential_Proclamation__National_Preparedness_Month_2013.pdf.

[94] FEMA, "Citizen Corps Councils Registration and Profile Data FY2011 National Report,"

without access to accurate information, the whole community is unable to adequately plan and integrate resources for disaster response and preparedness in line with FEMA objectives.

Finally, the failure to share information also contradicts recommendations provided by former Director of EPA's Office of Emergency Management Deborah Dietrich regarding coordination between the Citizen Corps and Local Emergency Planning Committees (LEPCs). Ms. Dietrich sent an August 2009 letter to all State Emergency Response Commission (SERC) Chairs recommending that all LEPCs work more closely with the Citizen Corps regarding the Emergency Planning and Community Right to Know Act of 1986 (EPCRA). She told them to consider "whether working more closely with the Citizen Corps could make your EPCRA and RMP work more effective."[95] Without basic knowledge about crude oil moving through their communities by rail, these planning committees are unable to accomplish their intended goal.

2. Rail Car Design

The DEIR suggests that DOT-111 non-pressurized tank cars would be used. DEIR, p. 4.7-25. However, as documented above, based on recent accidents and various proposed rulemakings, these railcars are known to pose significant risks when used to transport crude oil in unit trains.

Railcars are typically (99%) owned by the refiner, a leasing company, or a midstream producer, rather than the railroads.[96] Thus, there is no pre-emption issue and Phillips 66 has control over its railcars. The County can and should establish standards that the Project's railcars must meet. These standards should include the use of DOT-112 or DOT-114 when transporting Level 4 material such as Bakken and otherwise, the use of DOT-111 built to the most current standards, currently as of October 1, 2011, which include increased head and shell thickness; normalized steel; 1/2-inch thick head shield; and top fitting protection. DEIR, p. 4.7-25.

3. Train Staffing

A unit train carrying crude oil can weigh up to 15,000 tons and extend for up to a mile in length. Directing such a vehicle from point of origin to its destination is an inordinately demanding task, especially given the enormous risks involved if a mistake is made.

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https://s3-us-gov-west-1.amazonaws.com/dam-production/uploads/20130726-1854-25045-2121/citizen_corps_councils_final_report_9_27_2012.pdf, September 2012.

[95] Dietrich, Deborah, Letter to SERC Chairpersons, ftp://tbrpc.org/dri/Documents/LEPC/MISCELLANEOUS/EPA's%20EPCRA%20Letter.pdf. August 20, 2009.

[96] AAR, Moving Crude by Rail, May 2013, p. 9.

The range of tasks and responsibilities imposed on train staff includes powering up, maintaining speed (in compliance with ever-changing speed limits, changing grades, and track conditions), constant visual surveillance of the track and traffic control signals, continuously operating the radio, completing required paperwork, and remaining aware of other rail traffic.

Further, FRA rules require that each car in a hazmat train be inspected visually for defects, signs of tampering, and/or the presence of improvised explosive devices. 49 CFR 174.9(b). This could require over a mile of visual tank car inspections, thus requiring a solo staffer to be away from the locomotive for long periods.

In the event of derailment, collision, mechanical breakdown, etc, a massive piece of equipment such as a unit train cannot be safely operated by one individual. Redundancy in staffing is required to maintain safe operations. This has been recognized by the Federal Aviation Administration, which requires two pilots for all commercial flights. Crude unit trains should be subject to the same requirement.

Thus, the DEIR should include a condition requiring that Phillips 66 negotiate a contract with UPRR that requires at least two operators on each unit train carrying crude oil.

4. <u>Alternate Route Should Be Required</u>

The DEIR should have analyzed the safety and security risks of alternate transportation routes, including consideration of the crude volumes; track type, class, and maintenance schedule; track grade and curvature; environmentally sensitive or significant areas; population density along the routes; emergency response capability along the routes; passenger traffic along the route(s) (i.e., shared track); railway infrastructure (e.g., signaling, track class, crossings, wayside systems, traffic density); geography; and areas of high consequence as defined in 49 CFR 172.820(c). Based on this analysis, the DEIR should have selected the route posing the least overall safety and security risk.

In particular, the DEIR should have selected a route to prevent catastrophic release or explosion in proximity to densely populated areas, including urban areas and events or venues with large numbers of people in attendance, iconic buildings, landmarks, or environmentally sensitive areas.[97] The route selected in the DEIR (without any analysis or justification at all) violates every tenant of safety analysis. The proposed route passes through some of the most densely populated and environmentally sensitive areas in the world.

The coastal route selected in the DEIR overlaps with passenger routes and passes through some of the most densely populated areas in the United States. The Capitol Corridor line travels between San Jose and Sacramento. The Pacific Surfliner travels along the coast between San Luis Obispo and San Diego. The San Joaquin line runs

[97] 73 FR 20752 (April 16, 2008).

between Bakersfield and the San Francisco Bay Area. The California Zephyr runs between Emeryville and Chicago. The Coast Starlight run between Los Angeles and Chicago. DEIR, Sec. 4.12.

Further, the chosen route passes over 99 bridges and major road crossing in just San Luis Obispo County alone, of which only 33 are grade-separated crossings, where the railroad passes above or below the crossing. DEIR, p. 4.7-28. The DEIR failed to inventory bridges and crossing anywhere else. DEIR, Sec. 4.7 & 4.12. However, there are likely many in densely populated areas that unit trains will pass through. Many of these are likely unseparated and thus would increase the potential for accidents. DEIR, p. 4.7-28. As it could take over an hour for a unit train to pass through any given crossing, massive traffic jams could result in areas like the San Francisco Bay Area, Silicon Valley, and the greater Los Angeles area. The interaction of train traffic and rail traffic was not evaluated in the DEIR. Any increase in congestion due to this Project would be a significant impact that was not analyzed or mitigated.

The 9/11 Act, generally used to argue for safety of existing railroads, was enacted in 2007, when just 5,897 carloads of crude petroleum originated on U.S. Class I railroads. Last year, that number grew to 233,819 carloads – a growth of more than 3865%.[98] In 2013, that number has grown again, totaling 299,052 through the first 3 quarters (averaging about 100,000 per quarter). Assuming volumes will be similar in the fourth quarter, there will be about 400,000 carloads for all of 2013 – a growth of about 6700% relative to carloads in 2007.[99] This exponential growth in unit shipments of crude by rail and associated incidents, as well as the recent Lac-Mégantic disaster, compel the conclusion that unit shipments of crude oil demand enhanced safety standards and should be subjected to the re-routing standards as "security sensitive" materials as set forth in the 9/11 Act.

Finally, hybrid logistics, where crude is offloaded from rail at intermediate terminals, with transport via water and/or pipelines used for final delivery to the Refinery, should have been considered as alternatives to a 100% by rail delivery route. These are clearly on Phillip 66's[100] and other refiner's [101]plates.

5. <u>Mitigation Is Deferred To The Future</u>

The DEIR recommends several mitigation measures that would be developed in the future, outside of the CEQA review process. Thus should be fully developed as part of the DEIR to assure adequate public review.

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[98] AAR May 2013.

[99] AAR, August 29, 2013; AAR November 7, 2013.

[100] Phillips 66, Crude by Rail & Intermodal Supply Chain, Optimization and Opportunities, Refiner-Led Summit 2013, Opening Keynote Panel, August 21, 2013.

[101] Tesoro, Deutsche Bank Energy Conference, January 9, 2014.

First, prior to issuance of construction permits and notice to proceed, various fire protection and emergency response services would be developed including: "Fire Protection Plan, Emergency Response Plan, Spill Prevention Control and Countermeasure Plan, training requirement for CALFIRE and the SMR fire brigade." DEIR, pp. ES-9, IST-33. These updated plans should be included as appendices to the DEIR for public review.

Second, the Applicant also "shall investigate methods for reducing the onsite emissions, both from fugitive components and from locomotives" and "implement a program to limit onsite idling" prior to issuance of the Notice to Proceed, and thus outside of CEQA review. DEIR, p. IST-1.

VII. ALTERNATIVES

The DEIR considered five major alternatives to the Project: (1) truck transportation; (2) marine transportation; (3) alternative rail unloading sites; (4) loop rail unloading configuration; (5) reduced rail deliveries; (6) no project alternative. DEIR, Sec. 5.1. None of these alternatives significantly reduce impacts. Thus, they are not "alternatives" to the Project under CEQA.

The DEIR failed to evaluate other feasible alternatives that would have lesser impacts and more benefits. These include: (1) use of crude from the Price Canyon Oil Field Project Expansion, which proposes to increase local output,[102] to the extent available, rather than importing by rail; (2) continue production from existing or other nearby oil fields using enhanced oil recovery; (3) use of alternate rail route through the Central Valley with new connector rail line west from Bakersfield; (4) hybrid delivery options (e.g., partial delivery by sea or pipeline); (5) restrict crudes that can be imported.

The DEIR also failed to conduct any analysis at all of the no project alternative, rejecting it out of hand as it would not meet any of the project objectives. DEIR, p. 5-24. What are they? However, economic interests (at the expense of environmental impacts) is not a valid consideration under CEQA. When the no project alternative is the most environmentally superior then the next most environmentally preferred must be selected. DEIR, p. 5-33

The purpose of the Rail Spur Project, evidentially, is to reduce operating cost by importing cheaper oil. However, this should not be allowed at expense of the potentially catastrophic environment consequences, which are externalities that must be weighed, mitigated, or replaced when mitigations are not effective. Local sources of crude can be secured without the Rail Spur Project. New oil fields are currently being developed. The use of locally sourced crudes is the next most environmentally preferred.

[102] Price Canyon Oilfield Project (Freeport McMoran Oil & Gas), Available at: http://www.slocounty.ca.gov/planning/environmental/EnvironmentalNotices/PXP.htm.